

Judge/fail/learn

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JUDGE | FAIL | LEARN

ENABLING AUDITORS TO MAKE HIGH-QUALITY JUDGMENTS
BY DESIGNING EFFECTIVE LEARNING ENVIRONMENTS

ico

The research presented in this dissertation was conducted at the School of Business and Economics (SBE), Department of Educational Research and Development, Maastricht University.

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JUDGE | FAIL | LEARN

ENABLING AUDITORS TO MAKE HIGH-QUALITY JUDGMENTS
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DISSERTATION

to obtain the degree of Doctor at Maastricht University,
on the authority of the Rector Magnificus,
Prof.dr. Rianne M. Letschert
in accordance with the decision of the Board of Deans,
to be defended in public
on Thursday May 18, 2017, at 14:00 hours

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SUMMARY

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From pilots to radiologists to auditors - professionals across many domains form judgments that affect us. However, these professionals also face a key challenge: they need to make judgments based on imperfect information and under considerable unpredictability. This dissertation explores one specific example; in the Netherlands as well as internationally, auditors do not consistently make accurate judgments, and not all judgments are sufficiently supported by evidence. Within the audit setting, this dissertation explores how professionals can be supported in making accurate, well-informed judgments under conditions of unpredictability.

Workplace learning is introduced as a framework for improving auditors' judgments. Taking an interdisciplinary approach, this dissertation integrates literature on judgment and decision-making, expert performance, auditing, and workplace learning, leading to four empirical studies investigating the central question whether workplace learning moderates the relationship between auditors' experience and the accuracy and support of their judgments. Specifically, this dissertation explores four mechanisms to foster workplace learning: the firm's learning climate, the amount and value of help that auditors seek, the amount and value of feedback that auditors receive, and the degree to which they engage in meta-cognitive activities.

All four studies are quantitative, with two taking a mixed-method approach, combining behavioral data from a representative case with self-report data. In line with classic expertise research, the case provides a realistic judgment situation for auditors, based on actual data provided by a Big 4 audit firm. A questionnaire based on validated scales and methods measures the workplace learning mechanisms. Across all studies, experience is shown to have a positive, if small effect: it is the necessary condition for making well-supported and accurate judgments. The sufficient condition however is workplace learning.

Consistently across all studies, results clearly show that not auditors' amount of task experience, but rather the degree to which they learn from this experience relates to their judgment accuracy and support. When provided with valuable feedback, working in a supportive learning climate

and when engaging in meta-cognitive activities, auditors made better supported and more accurate judgments, sought learning-directed help after making an error, and even were less overconfident.

These findings centered on workplace learning contribute insights to the other fields considered in this dissertation. First, enabling professionals' learning offers a means for addressing conditions of unpredictability and complexity highlighted by judgment and decision-making, as well as expert performance research. Second, these results contribute significantly to the understanding of knowledge development in the audit literature, being the first to empirically demonstrate the role of workplace learning in auditors' performance.

Next to the theoretical contributions, results presented in this dissertation have significant practical applications. Each of the workplace learning mechanisms can be influenced and managed at different levels within the audit firm. Consequently, implications are formulated for individual auditors, those in leadership roles, and for the firm as a whole. These implications take into account the nested nature of facilitating workplace learning, as well as constraints imposed by the audit sector.

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CHAPTER 1

GENERAL INTRODUCTION

"A smooth sea never made a skillful sailor"
- English Proverb

1.1 | MOTIVATION

"Some people are still talking about incidents, but it is getting more difficult to see them as such. This series of incidents looks rather like a pattern. In any case, these are alarming signals." In recent years, this statement by the Dutch minister of finance (Commissie voor Financiën, 2014) on developments in the audit sector in the Netherlands was not the only critical voice. Since the financial crisis in 2008/2009, the Netherlands as well as other countries has launched investigations into the financial sector. On an international level, the Public Company Accounting Oversight Board (PCAOB) in the US, the Financial Reporting Council (FRC) in the UK, and the Authority Financial Markets (AFM) in the Netherlands have heavily and publicly scrutinized the performance of audit firms. In a series of reports (AFM, 2010; 2014; 2015; FRC, 2015; PCAOB, 2016), all oversight bodies have highlighted that audit firms not only in the Netherlands, but also internationally, deliver audits that contain a significant number of deficiencies, defined as judgments that are based on insufficient or irrelevant evidence (AFM, 2010; 2014). The international umbrella organization that collects and compares inspection findings across more than 40 jurisdictions, the International Forum of Independent Audit Regulators (IFIAR), have also published several reports emphasizing that the audit profession is facing a structural problem. Janine van Diggelen, chair of IFIAR, explained the findings in an interview with NRC Handelsblad in 2014: "Too often, auditors sign off on financial statements, even though they have not collected sufficient information to base their judgments on. [...] In total, we looked at 989 audits performed in 38 countries. In a high number of audits, we found deficiencies: in total 1,260 times. Also, we do not see an improvement. [...] Thus, we are dealing with a structural problem" (van der Heijden, 2014).

As a response to these challenges, audit firms have invested heavily in measures to improve audit quality, such as detailed procedures, second partner reviews, training and refined incentive systems. Next to firm-specific efforts to improve that are communicated directly with the AFM, in 2014, a consortium of representative from the big 4 firms as well as from their professional organization, the Koninklijke Nederlandse Beroepsorganisatie van Accountants (NBA) have also published a common report on how audit quality can be improved. In this report, 53 measures are proposed, ranging from potential changes in the business model to a specific emphasis on the need for a culture change in the audit profession. In their 2015 assessment however, the AFM clearly states that these measures are not the goal, but can only be the start of a sustainable development: "audit firms have taken steps that need to form the basis for structural improvements of quality. It is of crucial importance that in 2016, they maintain their focus on sustainable culture change" (AFM, 2015). One year later, the 'Monitoring Committee Accountancy', an independent body implemented based on the NBA's 2014 report, published their first report, stating that even though the 53 measures to increase audit quality and to shape changes in culture and behavior are a good start, "the commission is not (yet) convinced that the measures suggested in 2014 [...] are sufficient to address the causes of the structural problem in the audit sector [...]" (Monitoring Commissie Accountancy, 2016). Figure 1.1 illustrates the pressure placed on the audit profession in the Netherlands since the financial crisis in 2008 / 2009. The regulator perspective is represented on the left, the audit firms' perspective on the right.

These challenges regarding the forming of well-supported and accurate judgments are representative of a wider challenge faced by professionals in many domains. Studies on judgment and decision-making in general (e.g. Gigerenzer & Gaissmaier, 2011; Tversky & Kahneman, 1974), as well as domain-specific studies (e.g. in healthcare and aviation) have repeatedly found that educated and motivated professionals do not consistently make the most appropriate judgments: for example, doctors have operated on wrong limbs (Carney, 2006) or disagreed on diagnoses of mammographies (Elmore, Wells, & Howards, 1998), and pilots have turned routine situations into disastrous crashes (Hagen, 2013). What these situations have in common is that judgments are formed based on collecting and acquiring incomplete information, in situations whose outcomes cannot be perfectly predicted, and where time pressure and with high stakes are prevalent for patients, passengers and society. Crucially, these characteristics seem to be inherent in many professional environments - they cannot be changed by individual actors or in the short term (Hogarth, 2005; Shanteau, 1992).

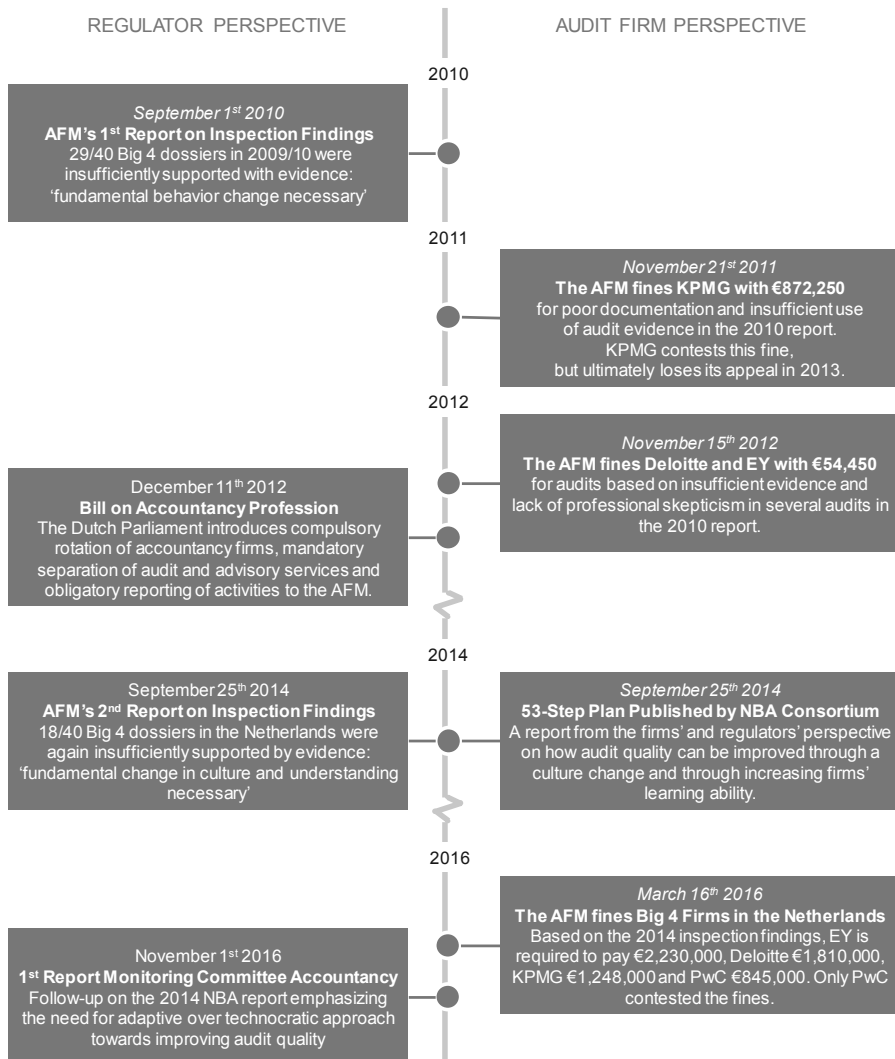


Figure 1.1. Timeline of audit regulators' (left side) and audit firms' (right side) analyses and consequences of audit deficiencies in the Netherlands, 2010 to 2016.

At the same time, these characteristics significantly impair professionals' ability to make accurate and well-supported judgments. Consequently, understanding how to support professionals in making accurate judgments despite these environmental challenges is a key question for many professional organizations, not just audit firms.

This dissertation explores how professionals can be enabled to make well-supported and accurate judgments under conditions of uncertainty. Specifying the research question and developing the theoretical framework requires an understanding of (1) the nature of professional judgments, (2) constraints inherent in the professional environment, and (3) mechanisms that help auditors navigate these constraints. Addressing these points necessitates a multidisciplinary approach; judgment and decision-making literature (within and outside of auditing) is used to operationalize the process and outcome of making judgments; expertise research forms the basis for defining the constraints under which professionals form judgments; workplace learning literature provides the approach towards navigating these constraints. Taking individual professionals' judgments as a starting point for the investigation, this introduction addresses each point in turn before providing an overview of the studies reported in this dissertation.

1.2 | THE NATURE OF PROFESSIONAL JUDGMENTS

The process of collecting and interpreting information as a basis for forming generic judgments is formally modeled in the diagnostic reasoning framework (Croskerry, 2009; Einhorn, 1976; Libby, 1985), relating to the definition of audit deficiencies by the AFM and IFIAR. In their seminal papers, Einhorn (1976) and Croskerry (2009) model diagnostic reasoning as illustrated in figure 1.2. In both models, the process of making a judgment is triggered by the presentation of situational cues (e.g. information by the audit client, or symptoms in a patient). Einhorn's (1976) model proposes that based on situational cues, professionals form a hypothesis, the most likely explanation of the situational cues. Through an iterative process, professionals then collect further information that may (dis-)confirm the initial hypothesis. Once a hypothesis is perceived to be correct, it becomes a judgment. Croskerry's (2009) model states that based on situational cues, professionals will either recognize a pattern or not, respectively triggering two modes of processing: an intuitive process (quick, effortless, low control over outcome) or an analytic process (slow, effortful, high control over outcome). Implicit in these two processing modes is the collection of further information (which is made explicit in Einhorn's model). Before a pattern is turned into a judgment, the professional goes through a stage of calibration. The professional will assess in how far the anticipated judgment is sufficiently based on the available evidence (analogous to Einhorn's condition of 'high likelihood of accuracy'), allowing the professional to express high confidence in the accuracy of one's judgment. A judgment is formed when professionals are confident that their judgment will be accurate. Despite their similarities, the two models have been

developed and applied for different professional fields. Einhorn's model (1976) was developed within auditing, hence the focus on evaluating hypotheses. Einhorn's work has informed a series of judgment and decision-making in auditing, such as on the role of heuristics, biases and task experience in judgment processes, as well as studies on audit expertise and information processing (Brown, Peecher, & Solomon, 1999; Libby & Frederick, 1990; Libby & Luft, 1993; Libby & Tan, 1994). Croskerry's (2009) model in contrast developed within the healthcare setting, explaining its focus on pattern recognition. It has inspired quite similar research to Einhorn's work, exploring the role of heuristics, biases and knowledge in doctors' diagnostic performance, with a specific focus on reducing diagnostic errors (Gigerenzer & Gaissmaier, 2011; Graber et al., 2012; Pham et al., 2012).

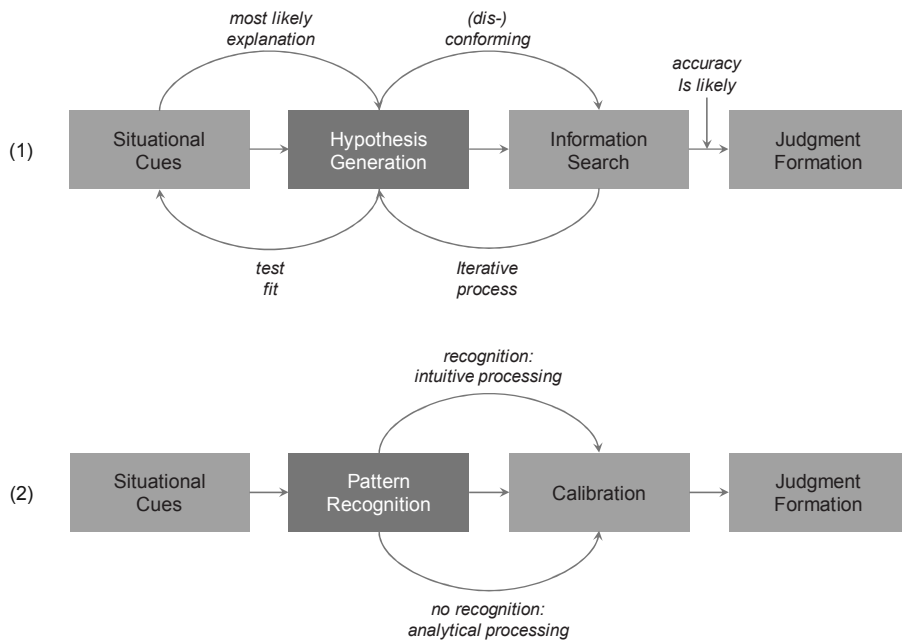


Figure 1.2. Diagnostic reasoning modeled in auditing (model 1) and in healthcare (model 2); Model 1 illustrates Einhorn's (1976) narrative; model 2 is adapted from Croskerry (2009).

Reflecting the interdisciplinary nature of the research in this dissertation and the overlaps between Einhorn's and Croskerry's models of diagnostic reasoning, professional judgments are operationalized in two principal ways:

- (1) Judgment Quality is defined as the process of collecting relevant evidence and the making of an accurate judgment (AFM, 2014; Einhorn, 1976). A high-quality judgment is accurate and based on relevant evidence; a low-quality judgment is inaccurate and not based on relevant evidence.
- (2) Calibration is defined as the match between the accuracy of one's judgments and the degree to which one is aware of this accuracy. A well-calibrated judgment is accurate (inaccurate) and paired with high (low) confidence in said judgment (Croskerry, 2009; Stone & Opel, 2000).

1.3 | CONSTRAINTS ON PROFESSIONAL JUDGMENTS

The diagnostic reasoning process as operationalized by Einhorn (1976) and Croskerry (2009) is heavily dependent on situational cues provided by the professional environment. Unfortunately, situational cues are not always perfectly suited for making well-supported and accurate judgments (Croskerry, 2009; Shanteau, 1992). The conditions under which situational cues enable the making of high-quality judgments have been studied by research on expert performance (Hogarth, 2005; Kahneman & Klein, 2009; Shanteau, 1992). Examples of situational cues studied in different professions are an ill patient's symptoms, instrument readings in a plane cockpit, a specific chess position, or barometer and thermometer readings. In this stream of research, professionals' ability to form accurate judgments depends on the degree to which situational cues are indicative of one specific judgment. This property in turn is understood to be an inherent characteristic of the professional's environment, described by the concept of environmental validity, "the causal and statistical structure of the relevant environment" (Kahneman & Klein, 2009, p. 520). Importantly, environmental validity is a stable characteristic of a particular environment.

Based on an extensive literature review, Shanteau (1992) specifies a series of characteristics that illustrate the validity of a specific environment (figure 1.3). The more an environment is characterized by factors on the left of the figure, the more will professionals make consistently high-quality judgments; the opposite is true for environments that are characterized mostly by factors on the right side. In Shanteau's review (1992), auditing is classified as a profession that brings about both consistent and inconsistent judgment quality: auditing is characterized by limited validity and is located between both extremes in figure 1.3. This view is reinforced by Abdolmohammadi (1999), who finds that auditors perceive some of their tasks as highly structured, and others as highly unstructured. Going one step further, Kahneman and Klein (2009) state that most professions are characterized

by limited validity. This limited validity has significant implications for professionals' judgments, it triggers the 'illusion of validity', in which professionals trust that all situational cues are valid, while this is not actually the case (Einhorn & Hogarth, 1978; Kahneman & Klein, 2009). Due to this inconsistency, professionals may not only form low-quality judgments, but may also display poor calibration, resulting in inaccurate or insufficiently supported judgment (e.g. Ryvkin, Krajč, & Ortmann, 2012; Tsai, Klayman, & Hastie, 2008; Zacharakis & Shepherd, 2001). In this sense, judgment quality and calibration are highly dependent on environmental validity, and which sheds light on the consistent findings by the AFM and IFIAR.

To gain insight into the challenges that limited validity places on auditors, for this dissertation, 65 auditors at a Big 4 firm were asked to (1) rate their own work on Shanteau's (1992) characteristics, and (2) to relate incidents in which their judgments were impaired by one of the characteristics. Of the 65 auditors who provided answers, 25 are juniors, 15 are managers and 13 are directors or partners. In figure 1.3, each dot represents the average score for a continuum. Overall, the auditors indeed felt that their environment is characterized by limited validity, as most dots are located around the middle of the continua. For four of the characteristics, auditors with the least experience (marked 'L') rated their work significantly lower than their colleagues with the most experience (marked 'H'): the nature of stimuli, predictability of problems, task repetitiveness, and availability of feedback. The average scores reported in figure 1.3 however only tell half the story - each of these ratings affect auditors' judgments in practice - table 1.1 relates a few of their stories.

Several of the statements included in table 1.1 may be considered as typical or representative for the research question addressed in the present dissertation. For example, one senior highlights the subjectivity of audit judgments (statement 1); not only is this person aware that the value of evidence is highly dependent on the context and the client, but at the same time, judging the evidence depends on preferences of supervisors as well. Two other seniors (statements 5 and 6) state that in tasks that appear to be routine situations at first, they tend to use 'common sense' and collect less evidence. Both have made the experience that this approach is efficient, but can also lead to inaccurate judgments. Relating these illustrations to the diagnostic reasoning model of Croskerry (2009), intuitive processing may be used instead of analytic processing, possibly leading to less collection of information and / or inaccurate judgments paired with high confidence.

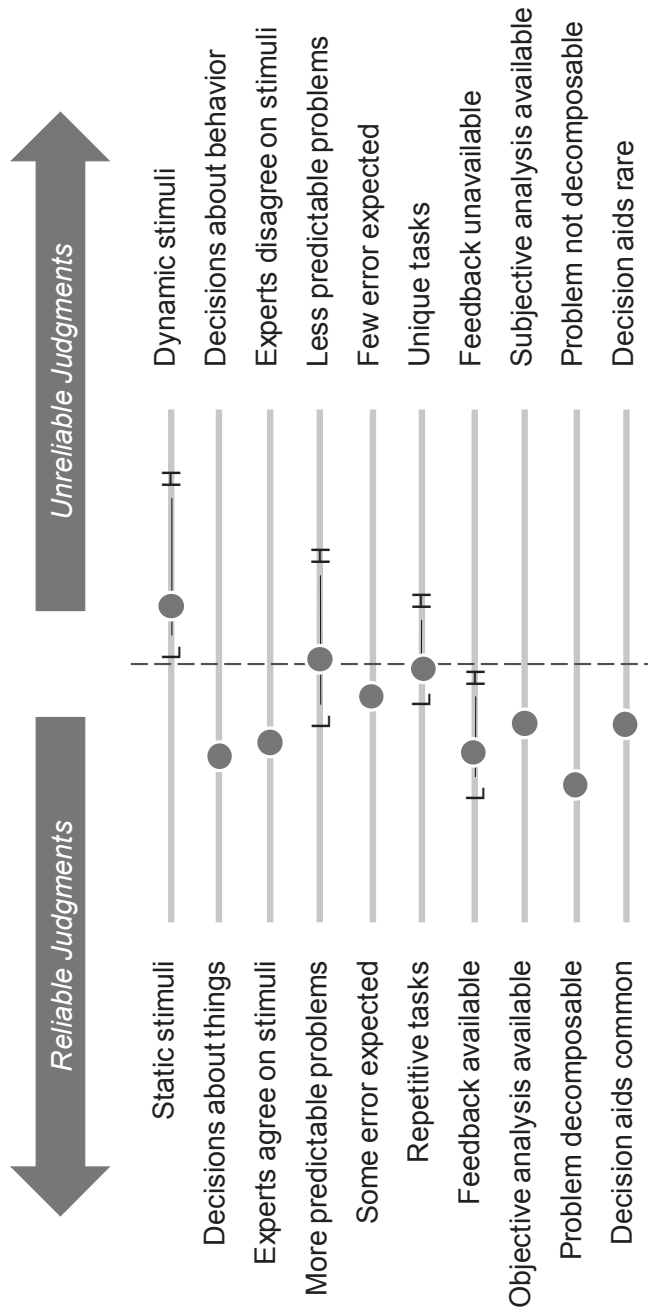


Figure 1.3. Auditors' perceived environmental validity; perceptions of auditors with low task experience is indicated with an L, experienced auditors' scores are indicated with an H where the difference was significant.

Table 1.1. Auditors' illustrations of Shanteau's (1992) characteristics

Nature of Stimuli

- (1) "Auditing the same FSLI¹ at different clients, one receives different kinds of audit evidence and has to judge it in a unique manner. Also I may use the same judgment, but as my supervisor is different I will be required to use judgment in their manner." (Senior)

Expert Agreement

- (2) "At one of my client's business, going concern² was not so evidently true; based on this we had to make as assessment of future results. Regarding all information received I made a completely different assessment from the partner. This is the result of our previous experiences and our knowledge. This makes judgment so subjective." (Senior)
- (3) "Often, once a conclusion is drawn no matter how judgmental or subjective we have the tendency to try to make it 'right' or 'wrong'. In my experience when a supervisor determines a conclusion is wrong, it doesn't matter where in the process the error was made." (Manager)

Predictability of Tasks

- (4) "I mostly solve unpredictable problems. Judgment was difficult by the fact that I had no one around me with sufficient experience to challenge me on the problem at hand." (Manager)

Task Repetitiveness

- (5) "For repetitive tasks / yearly comparable situations, you tend to make the same judgment using less information. This caused an issue when the situation changed and it was unclear which information was necessary to make the judgment" (Senior)
- (6) For some decisions we are making in an audit process, I tend to make decisions which are not well thought through. Instead of using a decision aid I just use common sense. " (Senior)
-

Notes: ¹financial statement line item, a category of assets or liabilities; ²judging whether the client is able to keep up operations for at least the upcoming 12 months;

Combining theoretical insights on limited validity with insights generated by the participants allows formulating constraints that are placed on professionals' diagnostic reasoning process. First, limited validity implies that situational cues cannot always be objectively interpreted and the same cues can indicate several outcomes across time. Second, limited validity may trigger pattern recognition that was appropriate in past situations but that is inappropriate in another. Consequently, professionals may seek less additional information that could disconfirm the recognized pattern. Third, limited validity facilitates miscalibration; professionals may not be aware of the degree to which their judgment actually represents the situation based on the currently available cues. These constraints that challenge each of the diagnostic reasoning steps therefore make it unlikely that professionals will consistently form accurate judgments based on sufficient or relevant evidence.

1.4 | ENABLING HIGH-QUALITY JUDGMENT UNDER LIMITED VALIDITY

A key question facing not just audit firms, but all professionals in limited-validity environments, is how the quality of professional judgments can be increased given these constraints. Within auditing, firms have adjusted their internal procedures and incentive systems to safeguard that all audits performed comply with the International Standards on Auditing (ISA). Simultaneously, the AFM has tightened oversight and control, publicly evaluating individual firms. In their 2016 report, the Monitoring Committee Accountancy labeled this approach 'technocratic': focusing on improving audit quality through a focus on structure, incentives and rules. This approach towards improving judgment quality implicitly builds on three assumptions that are rooted in economic thinking: (1) performance at a specific standard is possible, (2) individuals possess the necessary skills and knowledge to perform to the desired standard, and (3) incentives are effective at motivating individuals to use their abilities to perform optimally. Several of the auditors who provided insight in their environment's validity (see above) appear to agree with this view. One manager simply stated that "I do not expect to make inaccurate judgments: it slows down the process of getting to a decision". In a similar vein, one director finds that "in our profession, most errors can be avoided through diligent project management that is involving the right people at the right time, manage client expectations etc". Similarly, Geert Koster, lawyer at the Dutch Shareholder Association (VEB) stated that "AFM's strict checks are very much desired by the public, as is 'naming and shaming' audit firms in public reports. When deficiencies are found, the AFM needs to charge much higher fines. Audit firms do not respond to fines of €50.000 to €100.000 (EY and Deloitte), and even the €900,000 fine for KPMG in 2011 has apparently not led to a significant learning experience" (Koster, 2014).

This approach is criticized however. The AFM has consistently found that measures currently taken to incentivize firms and individual auditors towards performing better have not (yet) led to a significant decrease in deficiencies, the same finding summarized by IFIAR on an international level (AFM, 2014; IFIAR, 2016a). In addition, audit practitioners report that an increased focus on control and procedures is creating a culture of fear in which not quality, but compliance is rewarded: Huub Wieleman, former chair of the NBA, said in an interview that "everyone is scared to death that they may be punished for not following the rules. This culture of fear leads to a very detailed interpretation of the rules. We thereby start with principles, but end with rules. We still have a lot to learn here" (Piersma, 2015). Reacting to these outcomes, the Royal Dutch Professional Association of Accountants (NBA) writes in their 2014 report that "sanctioning is really not

the only, or most suitable way to better understand the objective reasons for a qualitatively inadequate audit and to improve audit quality. [...] To reach this understanding, learning from errors needs to be better institutionalized." (NBA, 2014, p.11). Former chair of the NBA, Willem Ouwehand, is quoted saying in the professional outlet *'De Accountant'*: "accountants too are faced with the dilemma of adapting to their environment: adopting the rules of the profession and learning from the environment. We need to leave the view of 'teaching is learning' behind; instead, it is all about learning from errors, your own, others' and the organization's" (*De Accountant*, 2015). Both statements represent a different approach towards improving judgment quality. In contrast to the assumption that high-quality judgments are consistently possible but require incentives to be realized, this second approach builds on different assumptions. It acknowledges that imperfect judgments will likely continue to occur due to the environment's limited validity, viewing them as inherent in the environment. Consequently, auditors and their firms need to learn from deficiencies in order to improve over time. The Monitoring Committee Accountancy (2016, p.76) calls this approach 'adaptive' in contrast to 'technocratic'. The adaptive approach "is focused on culture and behavior. A prerequisite for the adaptive approach is a safe working environment where there is room for making mistakes, for learning from them, and for confronting each other." The Monitoring Committee Accountancy observes that audit firms have so far emphasized technocratic measures over adaptive measures, which limits the desired culture change.

Thus, while there are several avenues towards improving audit quality by focusing on the role that professional knowledge plays (such as second partner reviews or team composition in the technocratic view), this dissertation focuses on the adaptive approach by studying how the development of professional knowledge at the individual level contributes to judgment quality. The theories of diagnostic reasoning (Croskerry, 2009; Einhorn, 1976) and environmental validity (Kahneman & Klein, 2009; Shanteau, 1992) presented above also emphasize the importance of knowledge, not incentives, as a means of fostering judgment quality, as illustrated in figure 1.4. From a judgment and decision-making perspective, professionals who possess sufficient and relevant knowledge will formulate higher-quality judgments than professionals who do not possess this knowledge (Croskerry, 2009; Einhorn, 1976). Diagnostic reasoning requires professional knowledge. From an expertise research perspective, environmental validity constrains not only the judgment process, but also the development of knowledge: Kahneman and Klein (2009) state that given an environment's validity, professionals need to have sufficient opportunity for learning to develop knowledge that enables professionals to distinguish

valid from invalid situational cues. Both theories therefore share their emphasis on knowledge as a key driver of judgment quality. Consequently, this dissertation targets the development of professional knowledge within limited-validity environments as a strategy towards improving judgment quality. For this purpose, literature that researches how professionals develop knowledge, and how this learning can be facilitated is central to developing specific research questions.

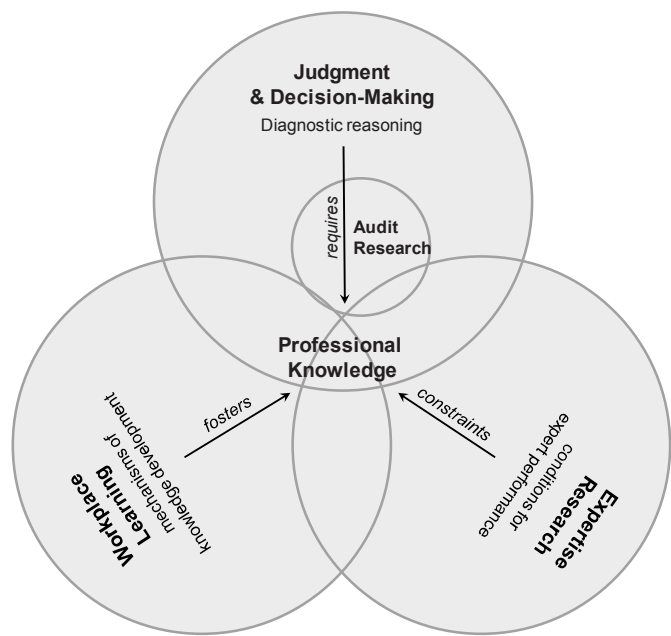


Figure 1.4. Interdisciplinary approach towards improving judgment quality in limited validity environments

1.5 | WORKPLACE LEARNING AS A LEVER OF JUDGMENT QUALITY

Professionals' knowledge development has been studied in several ways. Traditionally, professional learning is often viewed in terms of formal education and training (Eraut, 2000, 2004), and has as such been studied in detail both in the audit literature, but mostly in educational research (e.g. Blume, Ford, Baldwin, & Huang, 2010; Moreno, Bhattacharjee, & Brandon, 2007; Tharenou, Saks, & Moore, 2007; van den Bossche, Segers, & Jansen, 2010). However, the broader literature of professional knowledge development has consistently shown that learning in the workplace produces more professional knowledge than formal training or education only (e.g. Eraut, 2000; Eraut, 2004; Marsick & Volpe, 1999; Marsick & Watkins, 2001; Tynjälä, 2013). This dissertation therefore focuses on workplace learning to study how professionals can be enabled to make high-quality judgments in limited-validity environments. Given the focus on limited-validity environments, and especially auditing, the conceptualization of workplace learning in this dissertation needs to meet several criteria: (1) the nature of learning needs to be applicable to limited validity environments: the process as well as the outcomes of learning can therefore not be known in advance, (2) learning needs to be integrated with existing processes and procedures to minimize disruption and to maximize the occurrence of learning, and (3) the drivers of learning considered need to be malleable so that the results of the research can be readily applied by organizations to actively improve judgment quality.

Through a review of prominent theories of expertise development and workplace learning (table 1.2), in this dissertation workplace learning is viewed as (1) a circle of action and reflection (based on Marsick & Volpe, 1999), (2) requires effortful processing of information (based on Ericsson, Krampe, & Tesch-Römer, 1993; Salas & Rosen, 2010), and (3) that is completely integrated with daily, social work activities (in line with Eraut, 2000; Marsick & Volpe, 1999). Following the condition that mechanisms to be considered within this dissertation need to be malleable, in line with Eraut (2004), Ericsson et al. (1993) and Salas and Rosen (2010), three primary drivers of workplace learning are considered: (1) a firm's learning climate (Tynjälä, 2013); (2) feedback received from the environment (Eraut, 2000; Eraut, 2004; Ericsson et al., 1993; Tynjälä, 2013), and (3) individuals' effortful processing of information / reflection (Eraut, 2000; Ericsson et al., 1993; Marsick & Volpe, 1999).

Table 1.2. Overview of Theories of Expertise Development and Workplace Learning

	Deliberate Practice (Ericsson et al., 1993; Salas & Rosen, 2010)	Incidental Learning (Marsick & Volpe, 1999)	Informal Workplace Learning (Eraut, 2000, 2004, 2007)	Workplace Learning (Tynjälä, 2008; 2013)
<i>Nature of Learning</i>				
Intention	fully intentional	not highly intentional	(un-)intentional	un-)intentional
Activities	predefined	action-reflection cycle	needs-based	needs-based
Outcomes	predefined	undefined	undefined	undefined
Work Integration	separate from work	fully integrated with work	separate and integrated	separate and integrated
Social Nature	dyadic	social	social	social
Domain	high validity only	high / limited validity	high / limited validity	high / limited validity
<i>Drivers of Learning</i>				
Triggers	not specified	internal / external jolts	life events, projects, changes	not specified
Tasks	teacher-designed increasing difficulty	work-based level of challenge	task value of work level of challenge	work-based
Individual	motivation effortful processing	not specified	motivation / commitment confidence	knowledge, experience, motivation, commitment, ability, confidence, reflection
Environment	teacher support, feedback	interaction with others influenced by chance	trust and support relationships and feedback	structure, organization, staff expertise, HRD collaboration and networks, learning climate

Each of these three mechanisms of workplace learning can be influenced and managed; a firm's learning climate is determined and role-modeled by leaders within an organization (Cha & Edmondson, 2006; Edmondson, 2012; Edmondson, 2008); supervisors and colleagues can provide individuals with valuable feedback for learning if given the room and the knowledge (Anseel, Lievens, & Schollaert, 2009; Ashford, 1986; Shute, 2008); similarly, individuals can engage in reflection as a means to synthesize new information with existing knowledge given the right conditions, such as time, support and input (Boud & Walker, 1998; Flavell, 1979; Salas & Rosen, 2010). The focus on judgment and decision-making as well as workplace learning literature is relatively unexplored. Existing studies have focused either on formal training (e.g. Stone & Opel, 2000), or have viewed knowledge development as an automatic consequence of workplace experience (Hogarth, 2005; Russo & Schoemaker, 1992; Shanteau, 1992). This dissertation therefore explores the theoretical overlap between judgment and decision-making and workplace learning literature empirically, and systematically.

By implication, this dissertation does not emphasize characteristics of individuals (such as cognitive ability and style, personality or motivation) or environmental factors beyond the control of the firm (such as market dynamics, regulations and competitive pressures). This choice is made due to the objective of formulating actionable implications for firms to improve judgment quality through workplace learning, resting on existing studies on these stable or less controllable factors. Similarly, the choice was made to focus on workplace learning mechanisms rather than on the kind of knowledge that auditors need to make reliably high-quality judgments. On the one hand, given the domain's low validity, it is difficult to anticipate the kind of required knowledge, and there is a comprehensive body of research studying auditors' knowledge (e.g. Bonner, Libby, & Nelson, 1997; Frederick, Heiman-Hoffman, & Libby, 1994; Libby & Frederick, 1990); on the other hand, by focusing on mechanisms that drive workplace learning, irrespective of specific tasks or challenges, professionals can be supported in acquiring the required knowledge, adding an element of adaptability (Salas & Rosen, 2010).

The research presented in this dissertation also contributes to insights into workplace learning within auditing. While research on judgment and decision-making in the audit context has been studied across the past three decades (for reviews, see Nelson & Tan, 2005; Solomon & Trotman, 2003; Trotman, Bauer, & Humphreys, 2015), significantly less evidence exists on how auditors develop knowledge. One stream of research focused on training (e.g. Bonner et al., 1997; Plumlee, Rixom, & Rosman, 2015), a

second stream of research applied theories of expertise development to the audit profession (e.g. Bedard, 1989; Bonner, Lewis, & Marchant, 1990; Libby & Tan, 1994). Outside of these streams however, auditors' knowledge and task experience are often used as synonyms (Agoglia, Beaudoin, & Tsakumis, 2009; Payne & Ramsay, 2005; Shaub & Lawrence, 1996). While task experience is a good proxy for professional knowledge in valid environments, the two do not necessarily correlate in environments characterized by limited validity (Kahneman & Klein, 2009).

Workplace learning itself however has only been discussed in two audit studies to date. Hicks, Bagg, Doyle and Young (2007), as well as Westermann, Bedard and Earley (2015), survey accountants and auditors respectively about the perceived origin of their professional knowledge. Hicks et al. (2007) established through a survey that accountants perceive to learn most from completing (challenging) tasks and from interacting with others. Westermann et al. (2015) revealed through in-depth interviews with audit partners that their learning as well is mostly social and taking place in interaction with colleagues and clients. Their participants emphasize the need for a supportive workplace learning environment in which feedback is provided and in which challenging situations can be addressed. Taking together the importance of professional knowledge for diagnostic reasoning, the importance of learning for knowledge development in limited-validity domains, the characterization of workplace learning as an adaptive process, as well as auditors' own statements, this dissertation empirically investigates the moderating role of workplace learning on the relationship between task experience and judgment quality (see figure 1.5) as a means of deriving actionable implications for audit firms to design a supportive learning environment in which auditors can improve their judgment quality.

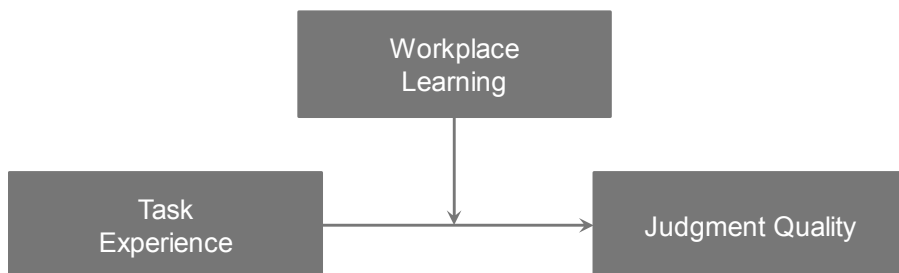


Figure 1.5. Baseline Conceptual Model of this Dissertation

1.6 | THIS DISSERTATION

This dissertation reports on four empirical studies that explore the role of workplace learning in fostering professionals' judgment quality. The studies are presented in two parts. Part I explores the role of professionals' amount of task experience in making high-quality judgments, and the moderating role of workplace learning. Part II builds on findings from Part I, holding amount of task experience constant, and instead exploring a specific kind of experience: making errors / forming an inaccurate judgment. The studies in this part explore the role that errors play in stimulating workplace learning, as well as how workplace learning enables professionals to improve their judgment quality. Within each section, one paper is written from a workplace learning perspective (studies 1 and 4), and one study is written from an auditing perspective (studies 2 and 3), reflecting this dissertation's interdisciplinary research question and approach.

Part I:

Leveraging Judgment Quality through Learning from Workplace Experience

Part I consists of two empirical studies in which workplace learning moderates the relationship between task experience and judgment quality. Figure 1.6 illustrates the conceptual framework followed in part I of this dissertation. Study 1 focuses on judgment quality as the dependent variable, while study 2 focuses on auditors' professional skepticism (defined below). Both studies in this section are conducted in collaboration with a Big 4 audit firm. Instruments for measuring judgment quality were modeled on actual client data supplied by the firm, and access was granted to a sample of auditors across all function levels at several offices.

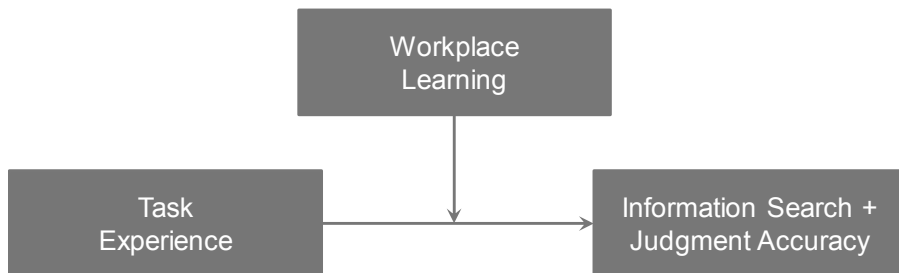


Figure 1.6. Conceptual Model for Study 1

The first empirical study (Chapter 2) explores auditors' judgment quality as a function of their amount of task experience and their engagement in workplace learning. Judgment quality is operationalized as the relationship between auditors' information search behavior, and their judgment accuracy. It is hypothesized that task experience enables auditors to distinguish relevant from irrelevant information, and in turn to translate this information into an accurate judgment. The degree to which auditors are able to learn from their experience is expected to positively moderate this relationship. Following the operationalization of workplace learning detailed above, four mechanisms are examined that are expected to strengthen the relationship between task experience and judgment quality:

- (1) Critical experience, such as fraud or a serious error is hypothesized to trigger learning, and in turn to produce knowledge that enabled the making of high-quality judgments (e.g. Cope & Watts, 2000; Rose, 2007)
- (2) The firm's learning climate is hypothesized to facilitate the undertaking of learning activities as part of existing, daily work, in turn enabling the making of high-quality judgments (e.g. Edmondson, 2008; Marsick & Watkins, 2003)
- (3) The amount of feedback received is hypothesized to foster learning from experience and in turn to enable the making of high-quality judgments (e.g. Ashford, 1986; Stone & Opel, 2000)
- (4) Individuals' engagement in meta-cognition is expected to act as a catalyst that transforms experiences into knowledge through learning, enabling the making of high-quality judgments (e.g. Anseel, Lievens, & Schollaert, 2009; Flavell, 1979).

To explore these hypothesized relationships, a mixed-method approach is taken, combining behavioral measures of judgment quality (see appendix I for more detail) with questionnaire-based, and previously validated, measures for the four mechanisms specified above.

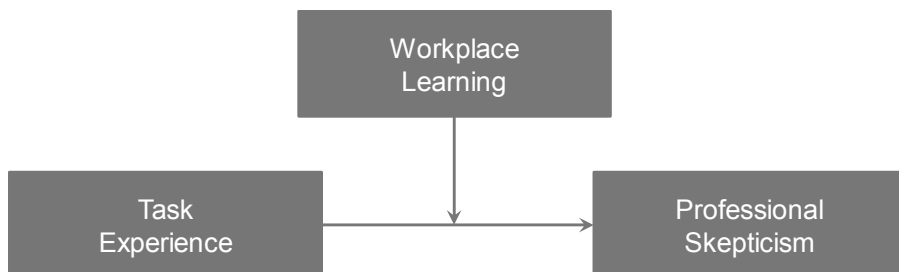


Figure 1.7. Conceptual Model for Study 2

The second study (Chapter 3) explores a precondition of making high-quality judgments within auditing: professional skepticism. This concept is defined as an attitude through which auditors defer making judgments until sufficient evidence is collected and until sufficient certainty can be gained (Hurt, 2010; Hurt, Brown-Liburd, Earley, & Krishnamoorthy, 2013; Nelson, 2009). As such, professional skepticism is highly related to the behavioral measure of judgment quality in the first study. Auditors' skeptical attitude is a latent concept (Nolder & Kadous, 2014) that is measured through Hurt's Professional Skepticism Scale (HPSS) (Hurt, 2010). The two most prominent models that describe antecedents of auditors' professional skepticism place knowledge at their center (Hurt et al., 2013; Nelson, 2009). Consequently, developing auditors' skeptical attitude requires the development of knowledge that auditors need to defer judgments, to interpret evidence and to make accurate judgments. Based on the observation that many audit studies use task experience as a proxy for professional knowledge (e.g. Agoglia, Beaudoin, & Tsakumis, 2009; Payne & Ramsay, 2005; Shaub & Lawrence, 1996), this study explores whether task experience actually contributes to auditors' skeptical attitude, or whether it is not the amount, but the degree of learning from this experience that actually enables auditors to become skeptical.

To address this question, a multidisciplinary approach is taken, systematically relating literature on auditors' professional skepticism to literature on workplace learning. Consequently, this study investigates whether three of the learning mechanisms described above, learning climate, feedback amount and value, and meta-cognition contribute to auditors' knowledge development from experience, and in turn, the development of a skeptical attitude. Through this approach, this study contributes to calls for future research for a deeper understanding of how professional skepticism can be encouraged in addition to the use of incentives, and provides audit firms with an additional set of levers that can be actively managed in an effort to improve audit quality.

Part II:

Leveraging Judgment Quality through Learning from Error Experience

A key finding of the studies presented in Part I of this dissertation is that judgment quality and professional skepticism are indeed related to the degree to which auditors are learning from their task experience, rather than by the amount of task experience itself. Based on these findings, a second set of studies was designed in which not the amount of task experience is investigated as the basis for learning, but rather a specific type of

experience: making errors (see figure 1.7 for the conceptual model). Study 3 explores the conditions under which experience of an error triggers learning behavior, and study 4 looks at how junior auditors can be supported in improving inaccurate judgments through stimulating reflection. The studies in Part II were conducted with a sample of junior auditors from eleven different audit firms, who are working towards their certification at two universities in the Netherlands. A questionnaire and experiment were designed to investigate the experience of errors as a trigger for workplace learning behavior (study 3), and to study how facilitating workplace learning can enable auditors to improve inaccurate judgments (study 4).

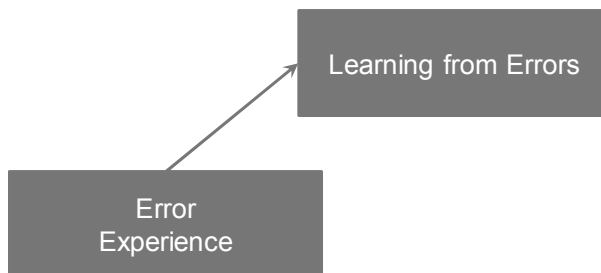


Figure 1.8. Conceptual Model for Study 3

The third empirical study (Chapter 4) explores learning from errors among junior auditors, who are in the beginning stage of their career and still learning the ropes, as well as being socialized into the profession of auditing. Using their own last error experience as a prompt, this study investigates the amount and quality of help auditors seek as an indicator of their learning behavior. Using a social network approach, auditors' learning behavior after making an error is operationalized as the amount and learning value of help that auditors seek (Bamberger, 2009; van der Rijt et al., 2013). The degree to which junior auditors seek help in order to learn from their errors is expected to depend on several factors:

- (1) Characteristics of the ties from which help is sought; it is hypothesized that help is sought most frequently from ties on the same hierarchical level, and from ties who are easily accessible. By contrast, these two characteristics should matter less with respect to the learning value of the help obtained (Morrison, 1993; Tucker & Edmondson, 2003; van der Rijt et al., 2013)
- (2) Characteristics of the individual auditor who faces an error; specifically, this study takes into account auditors' error orientation, their predisposition towards covering up or learning from errors (Gronewold & Donle, 2011; Rybowskiak, Garst, Frese, &

- Batinic, 1999). These predispositions are expected to have a negative and positive influence on help-seeking respectively
- (3) The learning from error climate within the firm, that is expected to support auditors in sharing their error experience and to actively seek help to learn (Putz, Schilling, Kluge, & Stangenberg, 2012; Tucker & Edmondson, 2003).

These factors are expected to explain variance of amount and learning value of help seeking at different levels: the tie level (hierarchy and accessibility) and at the individual level (error orientation and perception of learning from error climate). Therefore, this study employs a multilevel approach to analyzing this nested data.

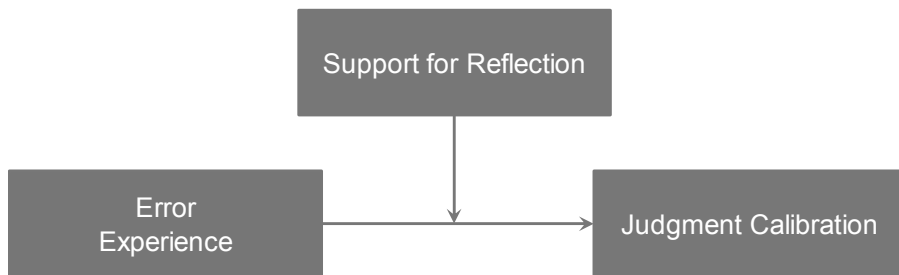


Figure 1.9. Conceptual Model for Study 4

The last empirical study (Chapter 5) investigates how auditors who made an inaccurate judgment can be supported in increasing their judgments' accuracy, as well as their calibration. Using a representative case based on actual client data by a Big 4 firm, calibration is operationalized as the difference between auditors' judgment accuracy and the confidence in the accuracy of their judgments. A positive calibration score indicates that accuracy exceeds confidence; a negative score represents the opposite. Auditors with a negative calibration score are said to be overconfident and expected not to correct their judgment, due to their lack of insight (Biais, Hilton, Mazurier, & Pouget, 2005; Ehrlinger, Johnson, Banner, Dunning, & Kruger, 2008; Lichtenstein & Fischhoff, 1977). Overconfidence has been found by several studies to hinge on performers' amount of knowledge (for a review see Ehrlinger et al., 2008). This study therefore explores how learning can be encouraged as part of existing judgment procedures in order to decrease overconfidence. Using an experimental manipulation, auditors who made an inaccurate judgment in the representative task (of which some are overconfident, and others are not) were randomly assigned to three different conditions:

- (1) The feedback condition: participants received performance feedback (Ryvkin, Krajč, & Ortmann, 2012; Stone & Opel, 2000), informing them of their inaccurate judgment, and instructing them to 'try again' without further support. In this condition, participants are not expected to be able to improve their judgment accuracy or to decrease overconfidence
- (2) The checklist condition: along with the performance feedback, participants receive a simple checklist, a commonly used tool in auditing to guide judgment processes and to ensure compliance with performance standards (for a review, see Boritz & Timoshenko, 2014). In this condition, judgment accuracy is not expected to significantly improve, and calibration is expected to worsen (Oskamp, 1965; Tsai et al., 2008; Wheeler & Arunachalam, 2008)
- (3) The reflection condition: along with the performance feedback and checklist, participants receive a series of questions designed to stimulate reflection on the checklist items. By encouraging reflection, learning from an inaccurate judgment and from support provided by the checklist is expected to not only improve judgment accuracy, but especially to decrease overconfidence.

This experimental approach to learning from errors, operationalized as making an inaccurate judgment in this study, adds to the other methods applied in earlier studies, and provides evidence on the effectiveness of three different tools that audit firms can employ to improve judgment accuracy and to decrease overconfidence.

Outline and Notes

Chapter 6 concludes this dissertation with a synthesis of findings across the four empirical studies, including a discussion of limitations, an agenda for future research, and an overview of the implications for practice. Chapter 7 presents the valorization addendum, elaborating on the relevance of the current research for practice. The appendix provides information on the methodology used to measure judgment quality, and also details the instruments used to measure concepts in Part I and Part II. In addition, a short CV is included detailing publications as well as valorization activities related to research presented in this dissertation.

Note: This dissertation is a collection of closely related studies. Since each study is written to be read on its own and as they are geared towards audiences from different academic fields, repetition and overlap between the chapters is inevitable.

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PART I

LEVERAGING JUDGMENT QUALITY
THROUGH LEARNING FROM WORKPLACE EXPERIENCE

CHAPTER 2

LEVERAGING PROFESSIONAL JUDGMENT QUALITY - LESSONS FROM DELIBERATE PRACTICE AND INFORMAL WORKPLACE LEARNING

"But although all knowledge begins with experience, it does not follow that it
arises from it" - Charles Darwin

ABSTRACT

Professionals across domains are required to make high-quality judgments and decisions. In domains with limited validity, performance even of experienced professionals is often inconsistent. In this chapter we investigate whether deliberate practice, within the context of informal workplace learning, leverages the effect of experience on professionals' judgment quality. Through a mixed-method study with professional auditors, we find that the effect of experience on judgment quality is effectively improved when professionals (1) acquire critical experience, (2) perceive a supportive learning climate, (3) receive feedback, and (4) engage in meta-cognitive activities. These findings have significant implications for both theory and practice.

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2.1 | INTRODUCTION & THEORETICAL FRAMEWORK

Organizations across professional environments rely on their employees' expertise to make high-quality judgments and decisions. From radiologists judging mammographies to detect tumors, to auditors who monitor clients' financial statements for cues of fraud; professionals rely on their experience to make judgments in the workplace (Kahneman & Klein, 2009). However, experience is not the same as expertise. Across a wide range of environments, research has shown that not all professionals perform at similar levels when they possess the same amount of experience (Elmore, Wells, & Howards, 1998; Payne & Ramsay, 2005). For example, Elmore, Wells, Lee, Howard and Feinstein (1994) find that when presenting the same mammographies to experienced radiologists, recommendations for follow-up vary significantly between radiologists (in up to 33% of the cases). Similar behavior was found within professionals. When evaluating the same scans a second time judgments differed in up to 9% of the cases. The internal consistency of radiologists' judgments seems therefore limited. In the audit environment, a recent review of 989 audits of the six largest audit firms has shown that in the period of one year, 1260 flaws were made, despite the fact that each audit is conducted and checked by multiple auditors with different levels of experience (International Forum of International Audit Regulators (IFIAR, 2016). This raises the question what distinguishes professionals' performance within the same levels of experience.

In their review on two decades of expertise research, Salas and Rosen (2010) find that deliberate practice is a crucial determinant of performance. Deliberate practice was first defined by (Ericsson, Krampe, & Tesch-Römer, 1993, p.368) as a "highly structured activity, the explicit goal of which is to improve performance" that is guided by a teacher, continuously challenging, including immediate feedback and requiring high cognitive effort. Recently, two reviews have been conducted on the relationship between the number of hours spent on deliberate practice as defined by Ericsson et al. (1993) and professional performance (Hambrick et al., 2014; Macnamara, Hambrick, & Oswald, 2014). In the environments games, sports and music, deliberate practice was found to explain between 18 and 34 percent of variance in performance. In education and the professions (e.g. aviation, medicine) however, deliberate practice was found to explain between less than one and four percent only across a review of seven effect sizes. Macnamara et al. (2014) present a potential explanation for this discrepancy: the underlying assumption behind the concept of deliberate practice is that it has been defined for environments with high validity. Kahneman and Klein (2009, p. 520) define environmental validity as "the

causal and statistical structure of the relevant environment". However, most professions are characterized by limited validity: the same information may not be indicative of the same judgment at all times. Professionals therefore need to learn to distinguish valid from invalid information to make high-quality judgments (Kahneman & Klein, 2009).

This chapter follows up on Macnamara et al.'s (2014) suggestion to apply deliberate practice to environments characterized by limited validity to get a better understanding of how experience and deliberate practice relate to performance. To achieve this goal, we first discuss how professionals form judgments in limited validity environments. Next we discuss deliberate practice in these environments by taking into account characteristics of workplace learning specified by the informal learning literature.

Making High-Quality Judgments in Limited Validity Environments

Making high-quality judgments, especially in limited validity environments, requires taking into account both the process as well as the outcome of professional judgments (e.g. Emby & Gibbins, 1988; Knechel & Messier Jr, 1990). Croskerry (2009) proposes a model of diagnostic reasoning that conceptualizes both components. Following Croskerry's model, when faced with a situation that requires a judgment, the first step is to collect relevant information. The second step is the interpretation of the retrieved information based on prior experiences, followed by the making of a judgment. Judgment quality then takes into account both the process of collecting information as well as the outcome, the actual judgment made. This is reflected in professional practice for example by the requirement for auditors to document the information they collected for each judgment made, specified in their analytical procedures, and the checklists provided to medical professionals in many different functions. We therefore formulate the following underlying hypothesis with respect to judgment quality.

- H1: Information search is positively related to judgment accuracy.

Croskerry (2009) highlights that professionals require extensive knowledge to effectively translate information from a situation into an accurate judgment. This knowledge is often operationalized as years of experience with a specific task; both Kahneman and Klein (2009) as well as Shanteau (1992) however explicitly state that under certain conditions, experience is not sufficient for high judgment quality: when validity is limited, experience supports the making of high-quality judgments in some, but not all

situations, depending on the degree to which information is valid. Kahneman and Klein (2009) suggest that in addition to amount of experience, professionals need to have sufficient opportunity to learn about the validity of their respective environment in order to make high-quality judgments. This requires learning to distinguish relevant from irrelevant information, to recognize relevant knowledge, and to interpret the information in the current context (Elmore et al., 1994; Kahneman & Klein, 2009; Wright & Wright, 1997). The degree to which professionals are enabled to make high-quality judgments therefore depends on (1) the validity of the environment and its characteristics (Shanteau, 1992), (2) the degree to which professionals engage in learning (Kahneman & Klein, 2009), and (3) characteristics of the individual professional as a driver of learning and performance (e.g. Shanteau, 1988). In this chapter we focus on the second determinant specified in extant literature, as an environment's validity is stable, as are most conceptualizations of individual differences, while learning can be actively supported and facilitated by organizations. To define and operationalize this learning, we build on two theoretical frameworks: deliberate practice as defined by Ericsson et al. (1993) and Salas and Rosen (2010), as well as on informal workplace learning as discussed by Marsick and Volpe (1999) and Eraut (2004).

Conceptualizing Deliberate Practice for Environments with Limited Validity

To translate the concept of deliberate practice to environments with limited validity, two assumptions underlying the original concept need to be considered. Firstly, deliberate practice as a concept was developed for environments with high validity, such as chess and music. In these settings, the objective of learning is known in advance, and curricula exist through which a teacher or coach can guide the learner (Eraut, 2004). In environments with limited validity by contrast, neither the knowledge necessary for future high performance nor the optimal way of developing this knowledge is known in advance (Tannenbaum, 2001). Second, deliberate practice has previously been described as separate from work processes and performance (van de Wiel & van den Bossche, 2013). Extant literature on professional learning and development however demonstrates that most professional learning takes place as part of daily work activities, not separately (Eraut, 2004; Marsick & Volpe, 1999): it takes place informally. Therefore, to realize the benefits of deliberate practice in professional environments with limited validity, it needs to take into account findings on informal workplace learning. Based on these assumptions, we propose a re-conceptualization of deliberate practice in line with current perspectives on informal workplace learning.

Marsick and Volpe (1999) characterize informal workplace learning by the following elements: “integrated with daily routines, ... triggered by an internal or external jolt, ... not highly conscious, ... haphazard and influenced by chance, ... an inductive process of reflection and action, ... linked to learning of others” (p.5). In contrast to deliberate practice, with its focus on which kind of activities lead to optimal learning, informal workplace learning is concerned with drivers of ongoing professional learning across different activities. This distinction is rooted in an important difference between environments with high and limited validity. In valid environment, it is possible to design specific activities that can be exercised repeatedly to improve a specific skill, because the objective of this learning is known in advance. For example, in order to play a certain piano piece, it is necessary to develop flexible and strong dexterity. By contrast, in environments with limited validity, the objective of learning and the knowledge necessary for high judgment quality of unknown. For example, to become a high-performing auditor, one needs to take into account constant changes in regulation, work organization and differences between clients. Work in limited validity environments is not proceduralized, standardized or repetitive enough to comply with the characteristics of deliberate practice as formulated by Ericsson et al. (1993). In this study, we illustrate the difference between learning in high and limited validity environments, by bridging the differences between deliberate practice and informal workplace learning. We will discuss the four characteristics of deliberate practice as mechanisms in relation to informal learning in turn.

The starting point of the learning process in deliberate practice is the repeated exercise of tasks crucial to performance in an environment (Ericsson et al., 1993). While these experiences would be consciously designed by a teacher in valid environments, we propose that in the workplace, critical experience provide professionals with important triggers for learning (Salas & Rosen, 2010). Critical experience is described by Cope and Watts (2000, p. 113) in the context of entrepreneurship learning as a “complex phenomenon that does not occur independently of the entrepreneur, but in many cases is a change in perception and awareness that stimulates the entrepreneur into action”. Examples of critical experience can be e.g. missing a cancer diagnosis based on a mammography, or discovering fraud while auditing a client's financial statements. Through critical experience, professionals learn about unexpected outcomes of their judgments, and in turn can learn to distinguish valid from invalid cues, contributing to judgment quality. Research on critical incidents, a more formalized research stream (Flanagan, 1954), has demonstrated the value of critical incidents for learning and future performance improvement (e.g. Clarke, 2008; Cope, 2003).

We therefore hypothesize that professionals who have acquired critical experience will be able to make higher-quality judgments, leading to the following hypothesis:

- H2: Task experience including critical experience moderates the relationship between information search and judgment accuracy.

The second element of deliberate practice, the guidance learners receive from a dedicated teacher, is unlikely in most professions to occur in the same way observed in music or chess (Salas & Rosen, 2010). On the one hand, as mentioned above, the knowledge necessary for future success is unknown both to the learner as well as to his or her colleagues. On the other hand, learning is not a core purpose in most professional environments – judgment quality is (Edmondson, 2008). Therefore, instead of a designated teacher who designs and supports learning from experience, at the workplace, this guidance may come from multiple sources, such as coaches, colleagues and clients / patients (Salas & Rosen, 2010). An organization's learning climate will then determine the role learning plays in daily work (Edmondson, 2008; Marsick & Watkins, 2003). In an organization with a supportive learning climate, learning is valued as part of daily work for continuous performance improvement (Marsick & Watkins, 2003). We therefore expect that professionals who acquire task experience in a supportive learning climate are more likely to develop the necessary knowledge to make high-quality judgments, leading to our third hypothesis:

- H3: Task experience made in a positive learning climate moderates the relationship between information search and judgment accuracy.

The third element of deliberate practice is continuous feedback, provided both by the task as well as the teacher or coach (Ericsson et al., 1993). The concept of feedback is highly relevant both in high and limited validity environments, as highlighted by Kahneman and Klein (2009) and Shanteau (1992). In addition to the feedback received from teacher and task in deliberate practice, feedback in the workplace is likely to come from a variety of sources, both within and outside the organization. We therefore expect that a professional will make higher-quality judgments when he or she acquired task experience including feedback, leading to our fourth hypothesis:

- H4: Task experience including feedback moderates the relationship between information search and judgment accuracy.

The final element of deliberate practice is the high mental demand placed on the learner by a learning activity (Ericsson et al., 1993). This high demand stems from two sources: the effort with which the task is executed to learn, as well as the awareness of the learning process itself. Relating this statement to Marsick and Volpe's (1999) conceptualization of informal learning as happening unconsciously as well as consciously, we follow Eraut's (2004) suggestion to allow for learning from activities with varying mental demands. We therefore represent high cognitive effort through the concept of meta-cognition (Feltovich, Prietula, & Ericsson, 2006; Sternberg, 1998): knowing about one's own knowledge, judgment processes and one's actual performance (Flavell, 1979). Several studies have demonstrated the importance of engaging in meta-cognitive processes, such as reflection for learning and performance (Anseel, Lievens, & Schollaert, 2009; Gabelica, van den Bossche, Segers, & Gijssels, 2014), leading to our fifth and final hypothesis:

- H5: Task experience including meta-cognition moderates the relationship between information search and judgment accuracy.

2.2 | METHODS

Sample and Participants

The professional environment of auditing was chosen as the context for this study because it requires professionals to make diagnostic judgments in a highly regulated environment with limited validity (Shanteau, 1992), and because experience is highly valued, as represented by the strong reliance on hierarchy in the design of auditor's professional organizations (Bédard, 1991). Additionally, the auditing profession has clearly defined procedures and indicators that allow us to measure both the process of information search as well as the resulting judgment's accuracy (Brown, Peecher, & Solomon, 1999). Finally, formal education, certification and training for aspiring and practicing auditors are standardized profession-wide on the national level, allowing us to focus on the contributions of informal learning on judgment quality. In collaboration with a Dutch branch of a Big 4 audit firm, we were granted access to 53 Dutch auditors across all function levels

on three locations, forming one business unit. Our sample represents the hierarchical structure of the organization, with 11 of the 13 partners (with an average of 17.64 years of task experience), 21 of the 68 managers (with an average of 13.76 years of task experience) and 21 of 123 juniors (with 1.95 years of average task experience) participating in this study. Our sample covers 17 female and 36 male professionals, with most female auditors on the junior and manager level.

Procedure

This study was designed in line with classic cognitive expertise research, by measuring performance through a task representative of the characteristics of the professional environment (Claessen & Boshuizen, 1985; Ericsson & Smith, 1991; Hobus, Schmidt, & Boshuizen, 1987). This approach has the advantage of allowing control over the stimuli presented to participants within a specific environment. This study makes use of two measurement tools: a case to capture judgment quality, and a questionnaire capturing task experience and informal workplace learning based on deliberate practice. Both measures were administered online directly following each other, in individual settings at the auditors' office location, with a researcher present to debrief each participant and to help with technical challenges.

The Case

The case for this study was created by the research team in collaboration with the participating audit firm, based on data of an actual client. A task was chosen that all auditors participating in this study are familiar with - auditing a client's accounts receivable - and that is characterized by a standardized approach to its analysis, while at the same time never providing absolute certainty to auditors, leading to limited validity in line with Shanteau (1992). In the case, participants learn that their client is still waiting on payment by two buyers, and that these outstanding positions have already been accounted for as revenue. Participants are requested to judge the likelihood of both buyers to settle their positions, and to advise the client whether the missing sums should rather be recorded as outstanding debt. In auditing, this task is known as auditing a client's accounts receivable, and previous studies on auditor performance often report this task to be associated with poor auditor judgments (Beasley, Carcello, & Hermanson, 2001; Payne & Ramsay, 2005). Participants worked on the case in an online environment using MouselabWEB (Willemsen & Johnson, 2008), and were presented with 20 information items from different sources

on which they could freely decide to base their judgment. MouselabWEB captured which of the items participants accessed, allowing us to operationalize the evidence collection process. This case included both relevant (60%) and irrelevant information (40%), but no false information, in order to increase case authenticity (Boshuizen, 1989). Participants were not given a time limit to investigate information, but were informed that time spent on the information items would be charged to their hypothetical time budget for the client in line with general audit practice. To capture the final judgment, participants were asked to evaluate how likely the two buyers in the case were to settle their outstanding positions.

Measurement of Judgment Quality

The Judgment Process: Information Search. The first element of judgment quality is operationalized in this study as the standard deviation of time spent accessing the different information items. This measure was chosen to represent the differential time participants are expected to spend investigating the relevant and irrelevant information presented in the case. A low standard deviation would indicate that participants spent equal time accessing all items, representing limited processing of the information content. A high standard deviation would indicate a clear focus on few (relevant) items, indicating purposeful processing of the information. Descriptives for this variable are reported in table 2.1. To control for this assumption, we ran an ANOVA to compare time spent on relevant versus irrelevant information between auditors who made an accurate versus inaccurate judgment. We indeed find that those participants who made accurate judgments spent significantly ($F = 11.851$, $p < 0.001$, $\omega^2 = 0.170$) more time on relevant information ($M = 2.332$ minutes, $SD = 2.306$) compared to participants with inaccurate judgments ($M = 0.768$ minutes, $SD = 0.890$). We did not find a significant difference in time spent on irrelevant information between the two groups ($F = 0.287$, $\omega^2 = -0.014$).

The Judgment Outcome: Judgment Accuracy. In the case, participants were asked to judge the likelihood of two buyers settling their outstanding positions, in percent. Information in the case was designed to indicate a high likelihood of payment for one, and a low likelihood of payment for the other buyer. By subtracting the percentage rating of the weaker buyer from the stronger buyer results in a percentage measure of the perceived difference between the two buyers. A positive difference indicates an increasingly accurate judgment, and a negative difference indicates an increasingly inaccurate judgment. Descriptives for this variable are reported in table 2.1.

Measurement of Deliberate Practice

The four different mechanisms of deliberate practice in limited validity environments, as well as amount of task experience, were measured through previously validated scales mostly. To measure critical experience, we were interested in participants' experiences requiring them to adjust their approach towards a certain client. Participants were therefore asked whether they had experienced at least one material error or fraud with any of their three main clients within the past three years. The resulting variable ranges from 0 (no incident with any client across the last three years), and 3 (at least one incident per client across the last three years). To measure learning climate, Marsick and Watkins' (2003) 6-item Likert-type 'inquiry & dialogue' scale from the 'Dimensions of the Learning Organization Questionnaire' was used to measure participants' perception of the audit firm's learning climate (Cronbach alpha 0.856) on a scale from 1 to 6. Feedback received in the workplace is measured using Ashford's (1986) 'amount of feedback received' scale, measured on a 5-point Likert scale, with a Cronbach alpha of 0.721. Participants' tendency to engage in meta-cognition is measured using the 7-item Likert-type cognitive self-consciousness scale from Cartwright-Hatton and Wells (1997) Meta-Cognition Questionnaire (Cronbach alpha 0.773). Task experience was measured in this study as the number of years participants had conducted audit tasks. Descriptives for these variables are reported in table 2.1.

Analysis

After confirming normality for all variables except for amount of task experience, one outlier was identified based on their high number of years of task experience, and the subject was removed from the sample. Next to descriptives and correlations, we used Hayes' (2013) PROCESS macros to conduct moderation analysis with a dichotomous moderator. Moderators were created by median-splitting the participants' scores on (1) years of task experience, and (2) the interaction terms of years of task experience with each of the four measures of deliberate practice. Using a dichotomous moderator allows us to contrast the influence of task experience and deliberate practice on judgment quality, taking into account the available sample. Due to the same reason, omega squared is reported for each model.

2.3 | RESULTS

Descriptives and Correlations

Table 2.1 reports the mean scores and standard deviation for each of the variables included in this study, both across the entire sample as well as for those participants with below- and above-median years of task experience (7 years). The participants with more than seven years of experience score higher on critical experience, information search and judgment accuracy, but also score lower on the four variables making up deliberate practice. Correlations between the variables (table 2.2) reveal that information search correlates positively and significantly with task experience ($r = 0.398$, $p < 0.01$) and feedback amount ($r = 0.365$, $p < 0.01$). In turn, judgment accuracy correlates positively with critical experience ($r = 0.325$, $p < 0.05$). The measures of deliberate practice, as well as the two variables making up judgment quality do not significantly intercorrelate.

Table 2.1. Descriptives

	Overall Sample			Low Experience		High Experience	
	Range	M	SD	M	SD	M	SD
Task Exp.	0-41	9.890	9.001	2.560	2.142	16.430	7.608
Critical Exp.	0-3	0.528	0.799	0.440	0.821	0.607	0.786
Learning Climate	0-6	4.296	0.765	4.533	0.805	4.083	0.672
Feedback A.	0-4	2.955	0.494	3.024	0.456	2.893	0.526
Metacognition	0-4	2.523	0.494	2.600	0.385	2.454	0.573
Info Search	0-1	0.368	0.217	0.309	0.234	0.421	0.190
Accuracy	-40-60	2.830	24.525	-4.400	24.509	9.286	23.083

Table 2.2 Correlations

	(1)	(2)	(3)	(4)	(5)	(6)
(1) Task Exp.	1					
(2) Critical Exp.	0.118	1				
(3) Learning Cl.	-0.141	-0.045	1			
(4) Feedback A.	-0.082	-0.065	0.206	1		
(5) Metacognition	-0.155	0.059	-0.108	0.178	1	
(6) Info Search	0.398**	0.272	0.190	0.365**	-0.026	1
(7) Accuracy	0.172	0.325*	-0.030	-0.078	-0.043	0.201

Note: Significance of correlations indicated as * $p < 0.05$, ** $p < 0.01$

In addition to the correlations and descriptives, we explored how many participants had accessed relevant information provided in the case and how many participants had come to an accurate judgment. Judgment accuracy was operationalized through two groups, one with negative or no difference between debtors (inaccurate) and those with positive judgment accuracy scores (accurate). Whether participants had accessed the relevant case information or not resulted in two more groups. The resulting 2×2 matrix that gives further insight into the distribution of the dependent variables is illustrated in figure 2.1. We find that only 41.5% of participants made an accurate judgment, and only 30.2% of all participants based this accurate judgment on the relevant information in the case. The largest group, 45.3% of participants neither accessed all relevant information nor made an accurate judgment.

		Judgment Accuracy	
		<i>Inaccurate</i>	<i>Accurate</i>
Relevant Information	No	45.3% (N=24)	11.3% (N=6)
	Yes	13.2% (N=7)	30.2% (N=16)

Figure 2.1. Descriptive results for information search vs. judgment accuracy

Hypothesis 1: Information search, judgment accuracy and task experience

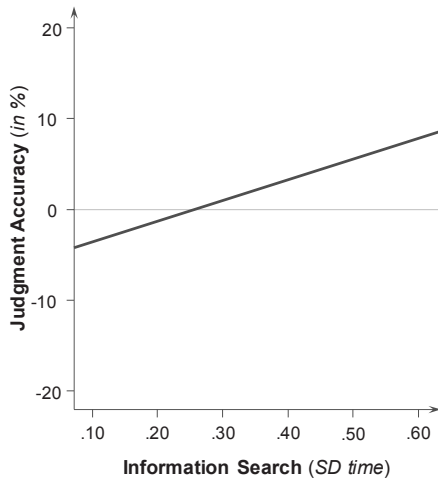
To investigate the first hypothesis, we ran a simple regression analysis relating judgment accuracy to information search (table 2.3, model 1). We find a positive (yet insignificant) coefficient, and a small effect size of $\omega^2 = 0.060$. Running a second model (table 2.3, model 2) with below- and above-median years of task experience as the moderator, we find a significant interaction between task experience and information search: auditors with more than seven years of task experience make increasingly accurate judgments when they pay attention to the relevant over the irrelevant information ($B = 66.390$, $p < 0.05$). For participants with below-median task experience, the attention paid across information items was not related to judgment accuracy ($B = -13.915$, $p > 0.05$).

Table 2.3. Interaction models studying judgment accuracy by information search and the moderating influence of workplace learning

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-5.715	24.483	5.002	2.729	3.729	2.468
Information Search	22.433	-13.916*	-23.615	-13.518	-13.518*	-14.633
Task Experience		-24.265				
Task × Critical Experience			-19.179			
Task Experience × Learning Climate				-25.518		
Task Experience × Feedback Amount					-25.518*	
Task Experience × Metacognition						-23.661
Three-Way Interaction with Information Search		80.305*	82.700*	80.628*	80.628*	81.618*
<i>Conditional Effects</i>						
Below-Average Moderation		-13.916	-23.615	-13.083	-13.956	-14.633
Above-Average Moderation		66.390*	59.075*	67.544*	74.677***	66.965*
Model Summary						
F-Value	2.058	3.189*	4.582**	3.095*	3.545*	3.473*
ω ²	0.020	0.081	0.178	0.110	0.127	0.127
ω ² change due to interaction		0.060	0.106	0.090	0.110	0.098

Note: significance is indicated as *p < 0.10, *p < 0.05, **p < 0.01

Panel A. Direct Relationship



Panel B. Interaction Task Experience

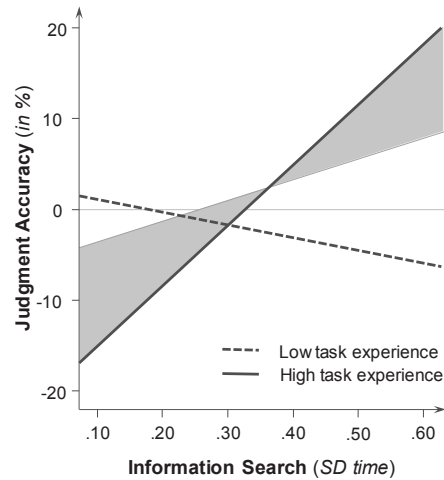


Figure 2.2. The relationship between information search and judgment accuracy; Panel A: direct relationship of judgment quality; Panel B: Conditional effects of task experience

The moderation model is significant ($F = 3.916$, $p < 0.05$), and a medium effect size of $\omega^2 = 0.081$. The change in ω^2 due to the interaction of information search and task experience is 0.060. These findings lend support to hypothesis 1 only for those participants with above-median task experience. The direct relationship of model 1 and the conditional effects of model 2 are illustrated in figure 2.2, Panel A and B respectively.

Hypotheses 2-5:

The leverage effect of deliberate practice on task experience

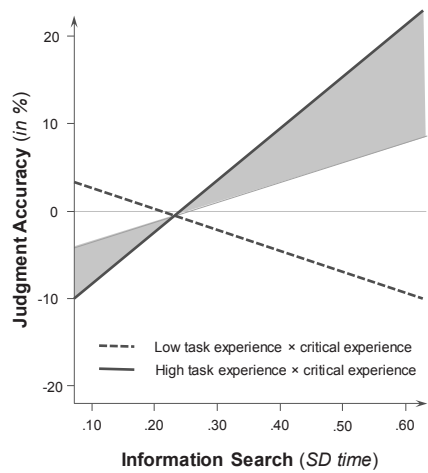
Table 2.3 also reports the results for hypotheses 2 to 5. For each hypothesis we ran a regression model in which the relationship between information search and judgment accuracy is moderated by experience and one of the four variables making up deliberate practice. For each hypothesis we look at the overall interaction, as well as the conditional effects of the dichotomous moderators. To test hypothesis 2, we looked at the effect of having task experience that contains critical experience (table 2.3, model 3). We find a significant and positive interaction term ($B = 82.628$, $p < 0.05$), with those participants scoring above-median on task experience with critical experience displaying more accurate judgments with increasingly

focused information search ($B = 67.544$, $p < 0.02$), while the coefficient is negative, if not significant, for the below-median group ($B = -23.615$, $p < 0.05$). The model is significant ($F = 4.682$, $p < 0.01$), with a large effect size of $\omega^2 = 0.178$. The ω^2 change due to the interaction is $\omega^2 = 0.106$, with a difference of 0.046 compared to only task experience as the moderator, a small effect. These findings provide support for hypothesis 2.

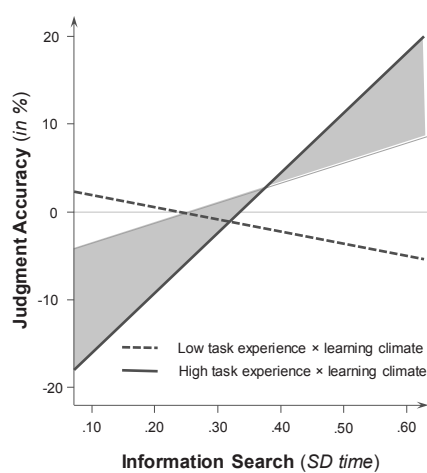
Hypothesis 3 is tested in the same manner, investigating task experience and learning climate's influence on judgment quality (table 2.3, model 4). In this model, both information search and the interaction between task experience and learning climate are close to the threshold of $p = 0.05$, with $p < 0.10$. The interaction term with information is again significant ($r = 80.628$, $p < 0.05$). As with the earlier models, a significant relationship between information search and judgment accuracy exists for those participants scoring above the median of task experience with learning climate ($B = 59.0745$, $p < 0.05$), while the same relationship is negative and insignificant for below-median scoring participants ($B = -13.083$, $p > 0.10$). The overall model is significant ($F = 3.095$, $p < 0.05$) with a medium effect size of $\omega^2 = 0.110$. The change in ω^2 due to the interaction is $\omega^2 = 0.090$, a medium effect, and the difference in this change between models 2 and 4 is 0.030, a small effect. These findings provide support for hypothesis 3.

Results for hypothesis 4, addressing amount of feedback received (table 2.3, model 5), reveal similar results to hypothesis 2. We find a significant interaction term ($B = 88.636$, $p < 0.01$) and again a positive and significant relationship between information search and judgment accuracy for those auditors scoring above-median on task experience with amount of feedback received ($B = 74.677$, $p < 0.01$), and an insignificant and negative relationship is found for the below-median scoring group ($B = -13.959$, $p > 0.10$). The overall model is significant ($F = 3.464$, $p < 0.05$), and a medium effect size of $\omega^2 = 0.127$. The change in ω^2 due to the interaction is $\omega^2 = 0.110$. Compared to model 2, this is an improvement of 0.050, a small effect, lending support to hypothesis 4. Finally, the model investigating hypothesis 5 and meta-cognition (table 2.3, model 6) again reveals similar results, with a significant interaction term ($B = 81.618$, $p < 0.05$), a positive coefficient for above-median scoring participants ($B = 66.985$, $p < 0.05$) and a negative coefficient for below-median scoring participants ($B = -14.633$, $p > 0.10$). Again the model is significant ($F = 3.473$, $p < 0.05$, $R^2 = 0.182$; $\omega^2 = 0.127$). The difference in ω^2 change between model 2 and model 6 is 0.038, lending support to hypothesis 5. The conditional effects of models 3 to 6 are illustrated in figure 2.3.

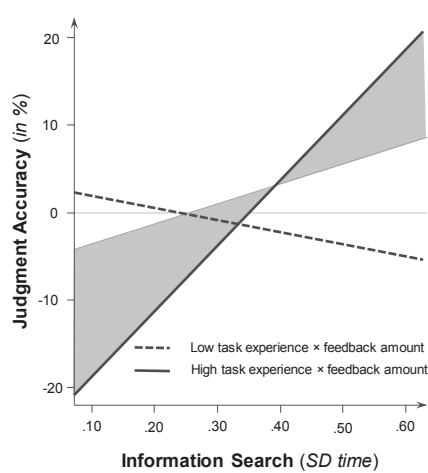
Panel A. task × critical experience



Panel B. task exp. × learning climate



Panel C. task exp. × feedback a.



Panel D. task exp. × metacognition

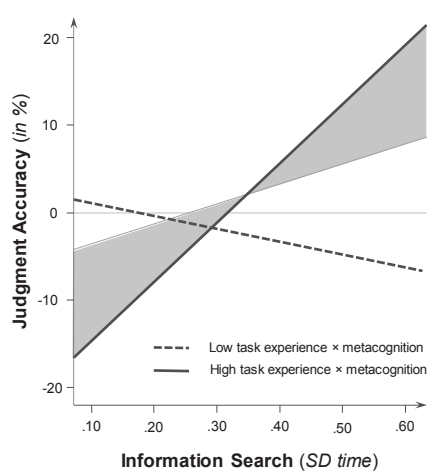


Figure 2.3. The relationship between information search and judgment accuracy by the interaction between task experience and deliberate practice

2.4 | DISCUSSION

Kahneman and Klein (2009) as well as Shanteau (1992) observe that task experience is a key determinant of professional judgment quality. At the same time, the authors emphasize that when faced with making judgments in limited validity environments, task experience may not be sufficient to ensure high judgment quality. In this chapter we investigated whether deliberate practice can leverage the effect of task experience on professionals' judgment quality. Addressing theoretical concerns with the concept of deliberate practice as introduced by Ericsson et al. (1993) as specified by Hambrick et al. (2014) and Macnamara et al. (2014), as well as the recommendations by Sonnentag and Kleine (2000), we broadened the concept to take into account characteristics of informal learning at the workplace Marsick and Volpe (1999). Viewing deliberate practice in terms of underlying learning mechanisms rather than specific activities allows translating the concept to tasks with limited validity, and to investigate its contribution to professional judgment quality. We find that critical experience, learning climate, feedback received and meta-cognition interact with task experience, leveraging the degree to which participants' information search is associated with judgment accuracy. This means that even with few years of experience spent engaging in (informal) workplace learning, participants could outperform more experienced colleagues who did not benefit from the same learning mechanisms. The effect size improvement by these interactions ranges from 0.090 to 0.110, and variance explained as indicated by ω^2 for the overall models range from 0.081 to 0.178, higher than the average finding by Macnamara et al. (2014) for professional environments (< 1%). We therefore conclude that learning as part of daily work is a promising avenue for understanding how to improve professional judgment quality.

Limitations and Future Research

This study is subject to several limitations. First, the set-up of this study is very contingent on the characteristics of the research setting. Data were collected within three locations of one firm's business unit. This has the advantage that noise in variables such as the learning climate is reduced, in line with earlier studies on informal learning (Eraut, 2004), but limits generalizability of the findings, especially to fields with professionals switch workplaces often. In addition, tenure and task experience correlate very highly in the audit environments (in our sample the correlation is $r = 0.968$, $p < 0.001$), because it is unusual for auditors to switch employers in the Netherlands. In environments where professionals change employers, tasks

or fields more often, measures need to be included that capture the different kinds of experiences in their respective learning contexts. Under these conditions, critical experience can also be measured in different ways, e.g. through experience with a specific challenge (e.g. fraud) or in a specific task. In addition, performance is measured using a case carefully created to mirror a realistic audit judgment situation. In line with classic cognitive research on expertise (Ericsson & Smith, 1991), this approach allows us to carefully capture the process of searching for information and controlling inputs for the judgment to be taken. Though beyond the scope of the current study, future research can expand on the operationalization of information search processes, e.g. by taking into account the order in which information is sought and the resulting belief revision (e.g. Tubbs, Messier, & Knechel, 1990), as well as by taking into account actual work performance on similar tasks, where available. Next to the environment-specific features of the design, characteristics of the sample as well as the choice of variables need to be considered. While the sample includes most higher-level auditors from the participating offices, the overall number still results in a small sample. Therefore, generalization is limited and findings need to be substantiated by future research. In this future research, an important next step is to investigate the role of individual characteristics previously associated with engagement in learning, such as self-regulation (e.g. Zimmerman, 2006) and cognitive abilities (e.g. Shanteau, 1992). We expect that individuals with these properties would take more advantage of the learning mechanisms discussed in this study, further leveraging the effect of task experience on judgment quality.

Implications for Practice

Based on the existing research on deliberate practice as well as informal workplace learning, the choice of the variables in this study lend themselves to the formulation of specific implications for practice. At the organizational level, leaders can create a supportive learning climate through role modeling (Edmondson, 2012). Communicating your own critical experiences, asking for honest input from different levels of the hierarchy, and publicly rewarding the learning of colleagues, they communicate values supportive of learning. A positive climate is expected to encourage individuals to utilize critical experience and feedback as effective triggers for learning (Edmondson, 2012; Marsick & Watkins, 2003). Moreover, according to Anseel et al. (2009), organizations can actively facilitate the use of feedback through reflection, a meta-cognitive activity. Members of the organization need to know how to effectively provide and receive feedback, and how and when to reflect. Moreover, learners require time to

exchange feedback and to reflect, which can be both reactive as well as deliberative (Eraut, 2004), flexibly meeting the learning needs of professionals in the moment. The actual undertaking of informal learning activities under these conditions will then depend on characteristics of the individual, as well as on the degree to which the organization's climate supports learning. Designing an environment in which professionals can improve their judgment quality then requires that organizations consciously create conditions for learning to occur, so that professionals not only accumulate years of experience, but actually learn from their experience.

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CHAPTER 3

DEVELOPING AUDITORS' PROFESSIONAL SKEPTICISM: THE EFFECT OF WORKPLACE LEARNING ON AUDIT QUALITY

"Uncertainty is an uncomfortable position. But certainty is an absurd one."
- Voltaire

ABSTRACT

Auditors are required to be professionally skeptical: to possess an attitude through which they suspend judgments until the evidence warrants making a judgment. Consequently, firms have a stake in increasing their auditors' skeptical attitude. However, conclusive evidence on the acquisition of professional skepticism and how it is related to auditors' task experience is missing. The present study introduces the concept of workplace learning – taken from the field of Human Resource Development - as a facilitator in acquiring professional skepticism. Workplace learning enables auditors to develop knowledge as part of their everyday work and can be actively facilitated by audit firms. Our findings show that task experience is not a significant determinant of professional skepticism - instead, it is the degree to which auditors are enabled to learn from their experience that is associated with a skeptical attitude. Consequently, workplace learning is an essential and yet ignored ingredient in fostering auditors' skeptical attitude, providing a new tool for audit firms to foster professional skepticism, and in turn, audit quality.

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3.1 | INTRODUCTION

Auditors are required to sufficiently support their own judgments with relevant evidence. Yet, oversight bodies such as the Financial Reporting Council (FRC) in the UK and the Public Company Accounting Oversight Board (PCAOB) have repeatedly observed that auditors' judgments are not consistently supported, lowering audit quality (e.g. FRC, 2015; PCAOB, 2016). To increase audit quality by ensuring that judgments are well supported, the FRC (2015), the PCAOB (2016) as well as audit researchers (Hurt, Brown-Liburd, Earley, & Krishnamoorthy, 2013; Nelson, 2009) emphasize the need for auditors to display professional skepticism. Professional skepticism is defined as "an attitude that includes a questioning mind and a critical assessment of audit evidence. The auditor uses the knowledge, skill, and ability called for by the profession of public accounting to diligently perform, in good faith, and with integrity, the gathering and objective evaluation of evidence." (SAS No. 1, AU 230.07-09). Auditors with a skeptical attitude have been shown to be more sensitive to audit evidence, to collect and interpret this evidence more carefully, and to delay judgments until they are sufficiently supported (Hurt et al., 2013; Hurt, Eining, & Plumlee, 2008; Nelson, 2009). Consequently, to improve audit quality, and specifically the degree to which auditors' judgments are supported by evidence, audit firms need to foster their staff's skeptical attitude.

Two models of professional skepticism specify antecedents that have been found to influence auditors' skeptical judgments and actions, the consequences of auditors' skeptical attitude (Hurt et al., 2013; Nelson, 2009). In both models, auditors' characteristics feature as key drivers. Some individual characteristics are described as traits: stable, non-knowledge properties of auditors that determine how an auditor manages evidence (Hurt, 2010; Nelson, 2009). In this conceptualization, firms can only increase PS by hiring or promoting those auditors who score high on trait skepticism (Farag & Elias, 2012). The trait perspective provides limited opportunities for actively increasing auditors' skeptical attitude. Next to traits, both models consider auditors' knowledge and experience as characteristics that influence auditors' skeptical attitude. While Hurt et al. (2013) consider auditors' experience and knowledge as stable, Nelson's (2009) model conceptualizes auditors' knowledge as the outcome of their experiences and training, making it malleable over time. In contrast to trait skepticism, knowledge as a driver of professional skepticism offers audit firms a lever through which skeptical attitude can be actively developed. A series of studies has investigated the relationship between task experience (used as a proxy for auditors' knowledge) and professional skepticism

(operationalized as judgments, actions and attitude) (e.g. Agoglia, Beaudoin, & Tsakumis, 2009; Payne & Ramsay, 2005; Shaub & Lawrence, 1996). Evidence by these studies however is inconclusive – task experience is not a reliable driver of professional skepticism. Two explanations exist for this observation: either, professional skepticism is indeed stable and therefore not related to auditors' experience (the trait hypothesis), or task experience is not measuring the factor that actually drives auditors' skeptical attitude: knowledge (the knowledge hypothesis).

Research on expertise, within auditing (e.g. Bédard, 1989; Bonner, Lewis, & Marchant, 1990; Libby & Tan, 1994) and outside (e.g. Kahneman & Klein, 2009; Shanteau, 1992) favors the knowledge hypothesis: knowledge does not automatically result from experience, especially under conditions of unpredictability and ongoing change. Consequently, it is not the amount of task experience that will drive knowledge, but rather the degree to which professionals learn from their experience (Kahneman & Klein, 2009; Shanteau, 1992). Within the audit literature, learning is mostly framed as 'training', formal instruction provided by a teacher or coach (Bonner et al., 1990; Westermann, Bedard, & Earley, 2015), and indeed, positive effects of training were found for fostering auditors' skeptical judgments and actions (e.g. Carpenter, Durtschi, & Gaynor, 2011; Plumlee, Rixom, & Rosman, 2015). Fostering auditors' knowledge development therefore has been shown to be effective for increasing professional skepticism.

However, training has two principal drawbacks as a means of developing professionals' knowledge. First, designing a training requires that the exact kind of knowledge or skill that auditors will need in future tasks can be known in advance, and that this knowledge will be applied to relevant future situations (Eraut, 2000; Marsick & Volpe, 1999). Especially under conditions of unpredictability and continuous change, it is unlikely that relevant knowledge can be anticipated (Marsick & Volpe, 1999). Second, studies on how professionals develop knowledge, in the academic field of workplace learning, have repeatedly found that professionals' knowledge derives only marginally from formal training and instruction, and is developed most effectively through learning from daily experiences at the workplace (e.g. Eraut, 2000; 2004; Marsick & Volpe, 1999; Marsick & Watkins, 2001; Tynjälä, 2013). In contrast to training, workplace learning does not rely on the kind of knowledge to be developed, but instead focuses on mechanisms that enable professionals to continuously develop new knowledge based on their own experiences and challenges. Moreover, rather than taking place outside of regular activities, workplace learning is fully integrated with daily activities; it takes place e.g. when observing or consulting a colleague, comparing different procedures, evaluating an inaccurate judgment or when

exchanging opinions on a piece of work (Eraut, 2004). This makes workplace learning a highly flexible and adaptive way of enabling professionals to develop new knowledge. Within auditing, evidence on workplace learning is still very scarce. To date, only two studies (one of them published in an audit journal) have explored workplace learning among accountants (Hicks, Bagg, Doyle, & Young, 2007) and auditors (Westermann et al., 2015). Both studies are descriptive in their approach, exploring how accountants / auditors learn at the workplace. In line with wider workplace learning research, both studies confirm that participants feel most of their knowledge is developed at the workplace, rather than through training. These insights are followed up in this study by systematically building on theories and findings from the field of workplace learning to investigate how audit firms can foster professional skepticism through workplace learning.

This study uses a cross-sectional survey approach towards researching whether mechanisms of workplace learning moderate the relationship between auditors' workplace experience and skeptical attitude, using validated measures. In total, 252 auditors across three offices and all hierarchy levels of one Big 4 firm participated in this study at the invitation of their respective office leaders. Using multiple regressions as well as subgroup analysis we find that task experience by itself explains between 0% and 3.5% of variance in auditors' skeptical attitude. By contrast, workplace learning mechanisms explain between 19.6% and 22.6% of variance. This makes workplace learning an essential and yet previously ignored ingredient in fostering auditors' skeptical attitude. These findings offer novel and significant opportunities for audit firms to increase their existing members' skeptical attitude by designing an environment in which they can effectively and continuously learn. The remainder of this study is organized as follows. In the hypothesis development, we introduce the workplace learning literature in more detail and relate findings from this field to existing studies and results within audit research. After the description of methods and results, we discuss our findings in light of both literatures, deriving limitations and implications for future research as well as for audit practice.

3.2 | HYPOTHESIS DEVELOPMENT

Modeling Antecedents of Professional Skepticism

Two main models specify the antecedents that influence and enable an auditors' professional skepticism: Nelson's (2009) model of determinants of professional skepticism in audit performance, and Hurtt et al.'s (2013) model of antecedents to and outcomes of skeptical judgment and skeptical action. Considering skeptical judgments and actions as products of auditors' skeptical attitude, both models serve to conceptualize knowledge as a driver of skeptical attitude. The role of experience and/or knowledge is conceptualized differently in these two models as illustrated in figure 3.1, which summarizes the parts of Nelson's (2009) and Hurtt et al.'s (2013), models that depict the role of auditors' knowledge in their respective models.

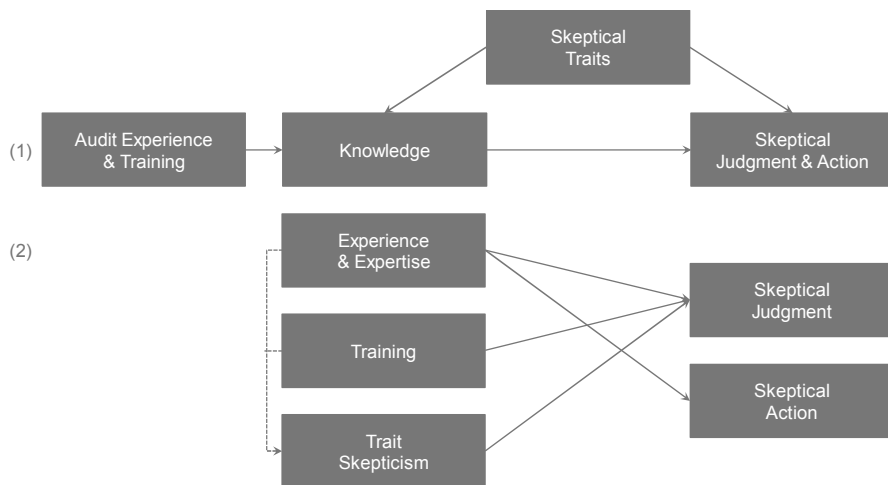


Figure 3.1 Antecedents of Professional Skepticism

In Nelson's (2009) model (model 1), knowledge is related to auditors' skeptical judgments and actions, and in turn is influenced by two other antecedents: auditors' experience and training, and auditors' traits. By contrast, Hurtt et al.'s (2013) model (model 2) presents experience, training and knowledge within the category of 'auditor characteristics', influencing skeptical judgments and actions in parallel to auditors' training and traits. In contrast to Nelson's (2009) model, the relationships between experience, training and knowledge are not formalized. However, Hurtt et al. (2013) propose that future research may provide insight into "whether trait

skepticism can be influenced by training or experience", thus proposing a relationship of the opposite direction to Nelson's (2009) model (illustrated through the dotted lines in model 2 in figure 3.1). This view of traits as characteristics that are influenced by auditors' experiences comes closer to the definition of professional skepticism as an attitude by AICPA (1997). This assertion is further supported by observations that trait measures may be affected by auditors' experience (e.g. Carpenter, 2004; Quadackers, 2009).

The Relationship between Task Experience and Professional Skepticism

Several studies have investigated the relationship between auditors' task experience and professional skepticism, operationalized as judgments and actions, as well as attitudes (e.g. Agoglia, Beaudoin, & Tsakumis, 2009; Payne & Ramsay, 2005; Shaub & Lawrence, 1996), as illustrated in figure 3.2 (relationship 1).

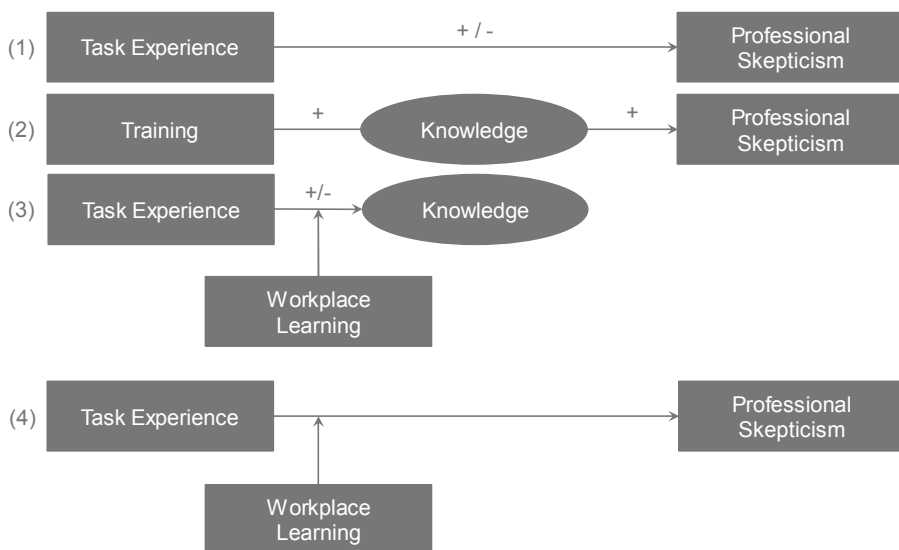


Figure 3.2. Overview of relationships studied in extant literature (models 1-3) and proposed model (model 4)

In a majority of these studies, task experience is used as a proxy for auditors' knowledge (e.g. Quadackers, 2009; Shaub & Lawrence, 1996; Grenier, 2013; Popova, 2013). Reviewing evidence on the relationship between task experience and professional skepticism produces a decidedly mixed picture. Several studies identified a positive relationship between task experience and professional skepticism. Regarding the making of skeptical

judgments and behaviors, Shaub and Lawrence (1996) report a positive association between years of audit experience and performance on a battery of 20 behavioral indicators of professional skepticism. Knapp and Knapp (2001) and Agoglia et al. (2009) showed that with higher rank in the audit firm, individuals are more effective at assessing fraud risk. Quadackers (2009) found that auditors who possessed more task experience generated a higher number of alternative audit explanations; provided more error explanations that were assigned a higher weight, and budgeted more hours to make a skeptical judgment.

However, not all studies find a uniquely positive relationship: several studies also find negative or no relationships. Contrary to their finding that years of experience positively relate to skeptical behavior, Shaub and Lawrence (1996) find that CPA certification correlates negatively with skeptical behavior. Similarly, Payne and Ramsay (2005) found that staff auditors made more skeptical judgments than their senior colleagues. Operationalizing professional skepticism as an attitude by inverting auditors' predisposition to trust others, Quadackers (2009) observed that the higher auditors rank within the audit firm, the more trust they display in their clients. A different result was found by Ashton (1991): the ability to recognize errors and to predict consequences of judgment varies significantly between auditors with the same amount of task and industry experience. Similarly, Phillips (1999) and Fathil and Schmidtke (2010) found that audit seniors and audit managers pay the same amount of attention to evidence of aggressive reporting and are equally likely to believe in a fraud explanation. These contradicting findings suggest that auditors' amount of task experience may be an unreliable proxy for knowledge, and may therefore relate consistently to professional skepticism. Building on the central role that knowledge plays in both models of professional skepticism's antecedents (Hurt et al., 2013; Nelson, 2009), we formulate our first hypothesis:

- H1: Amount of task experience is unrelated to auditors' skeptical attitude.

Developing Auditors' Knowledge for Professional Skepticism

Both judgment and audit literature have previously stated that task experience and knowledge are related, but separate concepts (e.g. Bédard, 1989; Kahneman & Klein, 2009; Libby & Tan, 1994; Shanteau, 1992). From a judgment research perspective, Shanteau (1992) and Kahneman and Klein (2009) state that faced with unpredictable tasks and outcomes, experience may not reliably lead professionals to develop representative

knowledge of the domain. This argument is specified in the audit literature, stating that auditors may not experience fraud or errors frequently enough for knowledge to develop and helping them to become or remain skeptical (Plumlee et al., 2015; Rose, 2007). As a reaction to this observation, Hurtt et al. (2013, p.52) suggest that "providing students and auditors with experiential learning in fraud detection may increase skeptical judgments".

One way through which auditors may acquire experience with and knowledge of fraud cues and error categories is formal training (figure 3.2 relationship 2). Several studies provide clear evidence that training can significantly improve auditors' performance on fraud-related tasks (e.g. Bonner et al., 1997; Bonner & Walker, 1994; Moreno, Bhattacharjee, & Brandon, 2007; Nelson, 1993), but only a small number of studies specifically focus on professional skepticism; Carpenter, Durtschi and Gaynor (2011; 2002) found that practice with fraud cases as well as participation in a forensic accounting class enabled novices to perform at the same level as or even outperform experienced auditors in fraud cue recognition and in recognizing abnormalities in financial statements. In parallel, Plumlee et al. (2015) found that training auditors in divergent as well as convergent thinking (generating new ideas from a specific starting point vs. using several cues to derive a specific conclusion) resulted in significant improvement of the number, quality and accuracy of explanations that participants generated for an unusual ratio fluctuation. These positive findings regarding the relationship between training and professional skepticism show that knowledge is indeed an important antecedent of professional skepticism.

Developing Auditors' Skeptical Attitude through Workplace Learning

Training may however not be the most effective (or efficient) tool to foster auditors' knowledge. Within auditing, Hicks et al. (2007) and Westermann et al. (2015) both demonstrate that auditors, especially partners, perceive to learn the most from their daily work experiences, rather than from specific training programs. Building on findings from the field of workplace learning, we extend their findings by relying on established theory and a body of findings that can help to gain further insight into auditors' knowledge development at the workplace. Workplace learning is defined by Marsick and Volpe (1999, p.5) through a series of characteristics: it is "integrated with work and daily routines; is triggered by an internal or external jolt; is not highly conscious; is haphazard and influenced by chance; is an inductive process of reflection and action; is linked to learning of others". This conceptualization emphasizes that experiences act as triggers for learning,

but the two concepts are fundamentally different: workplace learning is an ongoing process through which experience is turned into knowledge (figure 3.2, relationship 3). Described as such, workplace learning differs from formal training in several ways. First, formal training requires that a trainer or coach can anticipate which knowledge and skills will be necessary in future situations; however in environments facing unpredictability and ongoing change, this is unlikely (Eraut, 2004). Second, knowledge acquired in a training setting does not necessarily transfer to different tasks (Tynjälä, 2013). Third, formal training disrupts the work flow, while workplace learning takes place while professionals engage in their work, capitalizing on the undertaking of actual procedures and tasks (Marsick & Watkins, 2001). Consequently, workplace learning is not focusing on which kind of knowledge auditors need to develop, but instead enables auditors to flexibly develop the knowledge they need without the need of anticipation. One implication of taking a workplace learning perspective towards knowledge development is that not auditors' amount of task experience determines their skeptical attitude, but rather the degree to which auditors learn from this experience.

Unfortunately, research on the evidence of workplace learning within the audit domain is still scarce. Among the few researches, Hicks et al. (2007) surveyed accountants' perceptions of effective learning across a variety of experiences, finding that accountants prefer to learn from their daily work experience rather than from formal training, such as working on new tasks and solving problems with colleagues. More recently, Westermann et al. (2015) asked a series of audit partners to reflect on the activities and experiences that contributed most to learning across their career. The interviewed partners clearly indicate that they developed the majority of their professional knowledge through 'on-the-job learning'. Though not formally defined, 'on-the-job learning' is described consistently with Marsick and Volpe's (1999) definition of workplace learning. Both studies focus on the development of accountants' / auditors' knowledge, but do not focus on how this knowledge applies to other concepts. This study is therefore the first to explore how workplace learning affects auditors' skeptical attitude, taking into account an outcome of knowledge.

Studies in the field of workplace learning have also consistently shown that the majority of professionals' knowledge derives not from training programs, but from learning from daily work experiences (for reviews, see Eraut, 2004; Marsick & Watkins, 2001; Tynjälä, 2013). Building further on Hurtt et al.'s (2013) and Nelson's (2009) relationship between knowledge and professional skepticism, as well as the evidence on workplace learning as an effective driver of professional knowledge, we hypothesize that

workplace learning is an effective moderator on the relationship between task experience and professional skepticism.

Mechanisms of Workplace Learning

Studies that explore the conditions under which workplace learning takes place, show consistently that learning from workplace experience needs to be facilitated - it does not take place spontaneously, especially when professionals face high time pressure and competitiveness (e.g. Billett & Choy, 2013; Skule, 2004; Tynjälä, 2013). Facilitation of workplace learning can take place at three levels: (1) at the firm level, where the value that is attached to learning and performance improvement is determined, (2) at the supervisor level, where important incentives and information on performance is created, and (3) at the individual level, where the actual processing of experience into knowledge takes place (Marsick & Watkins, 2003; Salas & Rosen, 2010). Following results from workplace learning research, we explore one mechanism for each level that has been shown to effectively foster workplace learning across a variety of domains; to link these findings to the audit field, evidence from audit studies that relate to the mechanisms are reported to facilitate transfer.

At the firm level, workplace learning depends on the value that is attached to learning: it may be viewed as a means of continuous performance improvement that requires and warrants effort and investments; alternatively, efficiency in the short term may be prioritized over investments in later performance (Edmondson, 2004; Marsick & Watkins, 2001, 2003; Salas & Rosen, 2010). Within the workplace learning literature (Marsick & Watkins, 2003), this concept is referred to as learning climate, defined as "support[ing] the acquisition of information, the distribution and sharing of learning, and reinforc[ing] and support[ing] continuous learning and its application to organizational improvement. Such a climate is reflected by an organization-wide pattern of values and beliefs about the importance of learning, its implementation and dissemination" (Bates & Khasawneh 2005, p.99). In a supportive learning climate, experiences (both positive and negative) are seen as opportunities for learning, and professionals can share their experiences, e.g. to ask for feedback or help (Marsick & Watkins 2003; Edmondson 2012). In the audit domain, the related concept of firm climate / culture / 'tone at the top' has been positively related to decision-making quality (Libby & Tan, 1994), audit quality (reviewed by Jenkins et al., 2008), and reporting of errors (Gold, Gronewold & Salterio, 2014), and has also been identified as a crucial element of workplace learning by Westermann et al. (2015). The influence of learning climate on professional skepticism has not currently been researched, but based on the research

reported above; we expect a positive influence of a supportive learning climate on professional skepticism, leading to the following hypothesis:

H2a: Learning climate positively relates to auditors' skeptical attitude.

A supportive learning climate enables engaging in learning behaviors at different levels within the firm. At the supervisor level, feedback has been identified as an effective mechanism to foster learning from workplace experiences (Ashford, 1986; Gabelica, van den Bossche, Segers, & Gijssels, 2012; Salas & Rosen, 2010). In the context of workplace learning, feedback is a social concept referring to messages received from e.g. supervisors, colleagues or clients that contains information about a specific performance that cannot be generated by the professional (Ashford, 1986; Bamberger, 2009). Defined as such, the concept extends on performance feedback, which refers to the information whether a judgment was accurate or not, or whether a performance standard was met or not (Stone & Opel, 2000). Within the audit literature, research has focused on both performance feedback (e.g. Beck & Wu, 2006; Salterio, 1994) and on feedback as conceptualized in this study (e.g. Bonner and Walker, 1994). These studies reveal a positive relationship between receiving feedback and developing knowledge / improving judgments. Moreover, social feedback was identified as a crucial element of on-the-job learning in Westermann et al.'s (2015) qualitative study with audit partners. Based on these results, we expect that auditors who receive feedback that is of value to them will positively impact their skeptical attitude, leading to our next hypothesis:

H2b: Receiving feedback positively relates to auditors' skeptical attitude.

Finally, at the level of the individual, meta-cognition is a necessary catalyst for turning experiences as well as information received through feedback into new knowledge (Boud, Keogh, & Walker, 1985; Feltovich, Prietula, & Ericsson, 2006; Sternberg, 1998). Flavell (1979) describes meta-cognition as the monitoring and awareness of one's judgment process as well as of the accuracy of the resulting judgment. Through this processing of information, professionals can draw conclusions from their experience and information pertaining to it that translates into new knowledge, which can then be applied to new situations (Boud & Walker, 1998). Meta-cognitive activities have been studied in audit literature in the form of (team) brainstorming (Carpenter, 2004; Hoffman & Zimbelman, 2009) and instructions to reflect on judgments (Harding & Trotman, 2011). Carpenter

(2004) and Hoffman and Zimbelman (2009) find that (team) brainstorming increases auditors' skepticism (conceptualized as an attitude) and leads auditors to adjust their standard audit procedures when facing fraud risk, also indicating higher skepticism. Harding and Trotman (2011) stimulated auditors to reflect on their own judgments as well as on client management's statements made, and find that both targets of reflection are related to increased judgment skepticism, with a slightly larger effect for the second target of reflection. Meta-cognition is also indirectly identified as an important driver of auditors' on-the-job learning by Westermann et al. (2015), which leads to our next hypothesis:

H2c: Engaging in meta-cognition positively relates to auditors' skeptical attitudes.

Next, we are interested in whether auditors with different amounts of task experience benefit from different learning mechanisms. Observations made by both Hicks et al. (2007) and Westermann et al. (2015) showed that auditors in the beginning of their career report to learn strongly from others, while more experienced auditors report to be more independent in their learning. Similar observations are reported in the workplace learning literature, showing that with more experience, professionals are slightly less likely to seek help and feedback from others (Hofmann, Lei, & Grant, 2009; van der Rijt et al., 2013), and more likely to engage in individual learning activities (Eraut, 2007). By consequence, we hypothesize that the least experienced auditors will report a more skeptical attitude when receiving more feedback, while the most experienced auditors will benefit most strongly from meta-cognition. Understanding the learning needs of auditors with different amounts of task experience allows audit firms to provide targeted support for learning from experience, offering additional insight into how auditors' skeptical attitudes can be developed through workplace learning, leading to our final hypothesis:

H3: Auditors' skeptical attitude is related to different workplace learning mechanisms depending on their amount of task experience.

3.3 | METHODS

Sample and Procedure

Three offices from one Big 4 firm participated in this study. In total, 252 auditors from all function levels completed an online questionnaire. In office A, 137 auditors responded to an online survey spread and endorsed by the office (response rate: 67%). In offices B (48 participants) and C (67 participants), participants took part in a voluntary workshop during which they completed the online survey. The workshops were offered as part of the firm's regular events on quality management and as such, were endorsed by the office leaders. Office A is a collection of three smaller locations, while offices B and C consist of one or two large locations respectively. To account for these differences, office membership is included as a covariate in the following analyses as a categorical variable.

Before data analysis, seven observations were removed from the dataset due to incomplete responses. The final sample includes 141 juniors, 85 managers and 26 partners; 36% of participants are female, who are found mostly among juniors and managers. On average, participants had 6.69 years of audit experience with a wide distribution ($SD = 7.010$). In office A, the average task experience equals 6.69 years ($SD = 7.056$), yet 41% of participants are female. In office B, average task experience is 7.85 years, with 27% female participants. In office C, average task experience is 5.89 years ($SD = 4.837$), with 33% female participants (male participants are coded as 0, female participants as 1). While there are not significant differences in experience between offices, post-hoc analysis reveals that there are significantly more female participants in office A than in office B (mean difference = 0.081, $p = 0.088$), leading us to include both office membership and gender as covariates in the analysis.

Measures

Professional skepticism is measured using Hurtt's (2010) Professional Skepticism Scale (HPSS). The scale consists of 30 items (with a Likert scale of 1 - 6) and has shown high reliability in past studies (Hurtt, 2010; Quadackers, Groot, & Wright, 2014). While the scale was developed to measure trait skepticism, research by e.g. Carpenter (2004) showed that the scale does not capture unchangeable individual characteristics. By consequence, we chose the HPSS as our outcome measure to (1) take into account Hurtt et al.'s (2013) suggestion to explore the relationship between

task experience and trait skepticism, and (2) to understand the degree to which the scale captures stable traits or attitudes that are (in part) based on auditors' knowledge. Scale items include "I enjoy trying to determine what I read or hear is true", "I usually notice inconsistencies in explanations" and "I am interested in what causes people to behave the way that they do". In this study, all 30 Likert-type scores are summed up to make up the variable 'HPSS', which is normally distributed and shows high reliability with a Cronbach alpha of 0.856. In line with Hurtt's (2010) design of the scale, we also investigate participants' average score on six sub-scales of professional skepticism: (1) search for knowledge, (2) suspension of judgment, (3) self-determining, (4) interpersonal understanding, (5) self-confidence and (6) a questioning mind. The subscales' reliability ranges from 0.672 to 0.865. Following (Quadackers et al., 2014), we employ Hurtt's Professional Skepticism Scale as a proxy for the neutrality view of professional skepticism.

Task experience is a continuous variable measuring in years that participants had performed audit tasks at the moment of data collection, ranging between 0 and 28 years (e.g. Agoglia, Beaudoin, & Tsakumis, 2009; Shaub & Lawrence, 1996). The continuous operationalization of task experience is used in the multiple regression analyses specified below. In addition, forming three groups of equal size created a categorical variable of task experience. This categorical variable is used to assess differences between auditors with different levels of experience as explained in the section 'Analysis' below. We chose to form three uniform groups, due to the large difference in participants across function levels.

Learning climate is measured through two scales from Marsick and Watkins' (2003) Dimensions of the Learning Organization Questionnaire (Likert scale from 1 - 6). The first scale, 'opportunity for learning', measures individuals' perception of the degree to which learning from experience is supported by values and resources within their firm (Marsick & Watkins, 2003). Scale items include e.g. "In my organization, people help each other" and "In my organization, people view problems in their work as an opportunity to learn", with an overall reliability of 0.746 as measured by Cronbach's alpha. The second scale, 'inquiry and dialogue', focuses on individual auditors' perceptions of the openness of the firm's climate to voice opinions and concerns and to address difficult issues. The scale includes items such as "In my organization, people are encouraged to ask 'why' regardless of rank" and "In my organization, people listen to others' views before speaking" (Cronbach alpha = 0.848).

Two dimensions of *feedback* provided to auditors are measured: the perceived value of feedback received, and the amount of feedback received. Ashford's (1986) 'value of feedback received' scale measures how valuable participants perceive the feedback they receive to be in terms of performance improvements (Likert scale 1 - 5). Items include "I find feedback on my performance useful" and "It is important for me to receive feedback on my performance" (Cronbach alpha = 0.711). The 'amount of feedback received' scale asks participants to indicate how much feedback they receive from different sources: the supervisor, colleagues, own thoughts, the task itself, and from contacts outside of the organization (Likert scale 1-4). During the reliability analysis of this scale, a low Cronbach alpha of 0.514 was observed, resulting from a low corrected item-total correlation of $r = 0.130$ between feedback received from a supervisor and the scale. This item was therefore excluded from further analysis, resulting a Cronbach alpha 0.563, still low, but acceptable for further analysis.

Meta-cognition is measured using Cartwright-Hatton and Wells' (1997) cognitive self-awareness scale (Likert scale 1 - 4). The scale includes items such as "I pay close attention to the way my mind works" and "I rarely question my thoughts" (Cronbach alpha = 0.797). This scale measures the individual auditors' ability to monitor and regulate their own decision and learning processes.

Analysis

Data analysis to evaluate this study's hypotheses follows four steps. First, after establishing normal distribution of all scales, descriptives and correlations are calculated. Second, hypothesis 1 and 2 are investigated through multiple regressions. This method was chosen to understand both the nature of the tested relationships as well as the respective variance explained by task experience and the three workplace learning mechanisms with respect to auditors' skeptical attitude. Third, hypothesis 3 is addressed using ANCOVA to establish differences in skeptical attitude as well as workplace learning mechanisms between auditors with different amounts of task experience. Results from the ANCOVA are followed up by subgroup analysis. This analysis allows us to understand whether within the three groups of task experience, learning mechanisms affect the development of skeptical attitude differently.

3.4 | RESULTS

Descriptive Findings and Correlations

Descriptive results for all variables in this study are reported in table 3.1. Overall, participants score above average on each of the measured scales, with the lowest scores for feedback amount and meta-cognition, and the highest scores for professional skepticism. The correlations provide initial evidence on our first two hypotheses; task experience is negatively correlated with the climate measure of 'inquiry & dialogue' ($r = -0.147$, $p = 0.020$) and with HPSS subscale 'suspension of judgment' ($r = -0.158$, $p = 0.012$), and correlates positively with HPSS subscales 'self-determining' ($r = 0.115$, $p = 0.070$) and 'self-confidence' ($r = 0.194$, $p = 0.002$); at the same time, we find positive correlations between all five measures of workplace learning and HPSS overall, with r ranging from 0.107 (for 'opportunity for learning', $p = 0.090$) to 0.274 (for 'meta-cognition', $p = 0.000$). While all measures of workplace learning are intercorrelated, we do not find indications for multicollinearity. The HPSS subscale of 'search for knowledge' correlates very highly with the overall HPSS scale ($r = 0.822$, $p = 0.000$), and will therefore not be included in the same regression.

Hypotheses 1 and 2: Task Experience, Workplace Learning and HPSS

Table 3.2 reports the results of seven multiple regression models studying the six HPSS subscales: search for knowledge (model 1), suspension of judgment (model 2), self-determining (model 3), interpersonal understanding (model 4), self-confidence (model 5), questioning mind (model 6), and the overall HPSS score (model 7). Each model was developed in three steps: entering the control variables 'office' and 'gender', followed by 'task experience', then all workplace learning variables were included. The final step for each model is reported in table 3.1, including the change in variance observed between the three steps, which allows contrasting variance explained by task experience vs. workplace learning.

Table 3.1 Descriptives and Correlations

	M	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Office	1.722	0.857	1							
(2) Gender	0.360	0.481	-0.084	1						
(3) Task Experience	6.690	7.010	-0.036	-0.150*	1					
(4) Opportunity for Learning	4.631	0.574	0.068	-0.039	0.025	1				
(5) Inquiry & Dialogue	4.478	0.694	0.114 ⁺	-0.049	-0.147*	0.546***	1			
(6) Feedback Value	4.148	0.473	0.190**	0.047	-0.039	0.286***	0.217***	1		
(7) Feedback Amount	2.960	0.532	0.061	-0.006	-0.017	0.200***	0.183**	0.172**	1	
(8) Meta-Cognition	2.725	0.566	0.115 ⁺	-0.050	-0.089	0.141**	0.161**	0.175**	0.298***	1
(9) HPSS: Overall	125.254	13.150	-0.513***	0.052	0.034	0.107 ⁺	0.139*	0.115 ⁺	0.250***	0.274***

Note: Significance of correlations (2-tailed) indicated as ⁺p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001

Table 3.2 Multiple regressions explaining HPSS and its subscales by task experience & workplace learning mechanisms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Office A	0.577***	0.311***	0.144 ⁺	0.646***	0.353***	0.089	0.657***
Office B	0.005	-0.007	-0.014	0.328***	-0.056	0.022	0.103 ⁺
Gender	0.042	0.139*	0.035	0.094 ⁺	-0.264***	-0.079	0.017
Task Experience	0.076	-0.102 ⁺	0.031 ⁺	0.057	0.193***	-0.086	0.082 ⁺
Opportunity for Learning	0.063	0.041	-0.131 ⁺	-0.018	-0.059	-0.053	-0.035
Inquiry & Dialogue	0.146*	0.146*	-0.043	0.021	0.166*	0.066	0.140*
Feedback Value	0.176***	0.162**	0.072	0.045	0.028	-0.037	0.141*
Feedback Amount	0.131*	0.025	0.114 ⁺	0.130*	0.041	0.201**	0.173***
Meta-Cognition	0.235***	0.104 ⁺	0.091	0.236***	0.072	0.196**	0.269***
<i>Model Information</i>							
F-Value	20.816***	7.261***	2.228*	15.881***	8.810***	3.717***	24.324***
Variance explained by experience	0.000	0.019*	0.014 ⁺	0.001	0.024**	0.014 ⁺	0.001
Variance explained by learning	0.209***	0.092***	0.044 ⁺	0.096***	0.034 ⁺	0.101***	0.196***
Overall R Square	0.438	0.212	0.077	0.373	0.248	0.122	0.469
Adjusted R Square	0.417	0.182	0.042	0.350	0.220	0.089	0.449

Note: standardized coefficients are reported; significance is indicated as +p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001; Models are run for the HPSS sub-scales and the overall HPSS scale: (1) search for knowledge, (2) suspension of judgment, (3) self-determining, (4) interpersonal understanding, (5) self-confidence, (6) questioning mind, (7) complete HPSS

Looking at the relationship between task experience and HPSS and its subscales, we find one negative coefficient – yet only significant at the 10% level - relating to 'suspension of judgment' ($\beta = -0.102$, $p = 0.090$), and two positive coefficients for 'self-determining' ($\beta = 0.131$, $p = 0.043$) and 'self-confidence' ($\beta = -0.193$, $p = 0.001$). In line with hypothesis 1 however, task experience is only a marginally significant factor in explaining the overall HPSS score ($\beta = 0.082$, $p = 0.096$). Variance explained in the HPSS (sub-) scale(s) explained by task experience is a further indicator of the weak relationship between task experience and HPSS. With variance explained ranging from 2.4% (for the 'suspension of judgment' scale) to 0.0% (for the overall HPSS scale), we find strong support for hypothesis 1 stating that auditors' amount of task experience is unrelated to skeptical attitude. Investigating the relationship between workplace learning mechanisms and HPSS next, we find positive coefficients between the variables 'inquiry & dialogue' ($\beta = 0.140$, $p = 0.016$), 'feedback value' ($\beta = 0.141$, $p = 0.006$), 'feedback amount' ($\beta = 0.173$, $p = 0.001$) and 'meta-cognition' ($\beta = 0.268$, $p = 0.000$) with overall HPSS. The variance explained by these variables of the overall HPSS scale is 19.6%, a significant change in R square. Similar findings apply to the subscales HPSS. All significant coefficients are positive, and the respective significant change variance explained by adding the workplace learning variables (with the exception of the 'self-confidence' subscale) ranges from 3.4% to 20.9%. These findings provide strong support for hypothesis 2.

In addition to these results regarding our hypotheses, we observe three additional findings. First, the subscales of 'self-determining' and 'self-confidence' are significantly less explained by workplace learning than the other subscales and the complete HPSS scale. This allows for two potential conclusions. In line with Hurr's (2010) initial conception, these dimensions may be more stable across time than the other scales. Alternatively, they maybe influenced by variables not included in this study. Second, the control variable 'gender' positively relates to 'suspension of judgment' ($\beta = 0.139$, $p = 0.019$), 'interpersonal understanding' ($\beta = 0.094$, $p = 0.074$), and negatively relates to 'self-confidence' ($\beta = -0.264$, $p = 0.000$). Finally, the variable 'office' is explaining significant variance in HPSS and its subscales, indicating the need to account for differences between offices included in this study.

Hypothesis 3: Determining Auditors' Learning Needs

The third hypothesis investigates whether auditors with different amounts of experience benefit from different workplace learning mechanisms to develop a skeptical attitude. We run a subgroup analysis to account for possible differences in the relationship between workplace learning mechanisms and HPSS for auditors with low, medium or high experience. We split the overall sample into three equal groups on the basis of auditors' years of task experience. In the 'low' group (N = 93), participants have on average 1.46 years of task experience (SD = 1.051), and 43% are female. In the 'medium' group (N = 74), participants have on average 4.85 years of task experience (SD = 0.835), and 41% are female. In the 'high' group participants have an average of 14.18 years of task experience (SD = 7.511), and only 25% are female. For each subgroup we run the same four regression models: next to the covariates of office membership and gender, we enter task experience and (1) learning climate, (2) feedback, (3) meta-cognition, and (4) all workplace learning mechanisms. Again, we report variance explained by task experience and by workplace learning. The findings for each of the four models for each of the three groups are reported in table 3.3, 3.4, and 3.5 respectively.

Table 3.3. Stepwise multiple regressions explaining HPSS by workplace learning mechanisms for auditors with low experience

	(1)	(2)	(3)	(4)
<i>Variables</i>				
Gender	-0.038	0.020	0.042	0.064
Office A	0.530***	0.502***	0.564***	0.564***
Office B	-0.064	-0.076	-0.090	-0.092
Task Experience	0.237**	0.184*	0.187*	0.194*
Opportunity for Learning	0.187*			0.030
Inquiry & Dialogue	0.137			0.073
Feedback Value		0.150 ⁺		0.130
Feedback Amount		0.308***		0.235**
Meta-Cognition			0.367***	0.309***
<i>Model Summary</i>				
F-value	10.562***	12.842***	15.752***	12.339***
Experience variance	0.035*	0.035*	0.035*	0.035*
Learning Variance	0.072**	0.120***	0.123***	0.220***
R Square	0.424	0.473	0.475	0.572
Adjusted R Square	0.384	0.436	0.445	0.526

Note: Standardized coefficients are reported; significance of coefficients indicated as

⁺p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001

Table 3.3 shows the results for the 'low' experience group. In the overall model the amount of feedback received ($\beta = 0.235$, $p = 0.003$) and meta-cognition ($\beta = 0.309$, $p = 0.000$) relate significantly to HPSS. Overall, the workplace learning mechanisms explain 22% of variance in HPSS. Notably, task experience explains a significant, if small, 3.5% of variance in HPSS. Auditors in the first years of their career therefore benefit from all workplace learning mechanisms, and especially from receiving feedback and engaging in meta-cognition.

Table 3.4. Stepwise multiple regressions explaining HPSS by workplace learning mechanisms for auditors with medium experience

	Model (1)	Model (2)	Model (3)	Model (4)
<i>Variables</i>				
Gender	-0.023	-0.074	-0.058	-0.044
Office A	0.524***	0.618***	0.526***	0.612***
Office B	0.165	0.159	0.138	0.180 ⁺
Task Experience	-0.029	-0.032	-0.033	-0.005
Opportunity for Learning	-0.070			-0.067
Inquiry & Dialogue	0.264 ⁺			0.136
Feedback Value		0.336**		0.243*
Feedback Amount		0.179 ⁺		0.140
Meta-Cognition			0.382***	0.216 ⁺
<i>Model Summary</i>				
F-value	3.895**	6.987***	7.623***	5.620***
Experience variance	0.004	0.004	0.004	0.004
Learning Variance	0.043	0.170***	0.144***	0.226***
R Square	0.259	0.385	0.359	0.441
Adjusted R Square	0.192	0.330	0.312	0.363

Note: Significance of coefficients indicated as ⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.4 reports findings for the 'medium' experience group. In the overall model, the degree to which auditors value the feedback they receive ($\beta = 0.243$, $p = 0.032$) and their engagement in meta-cognition ($\beta = 0.216$, $p = 0.53$) significantly explained variance in HPSS scores. In this group, the workplace learning mechanisms together explain 22.6% of HPSS variance, while task experience explains an insignificant 0.4% of variance in the medium group. We therefore conclude that auditors in the middle of their career benefit in the development of a skeptical attitude not from the amount of feedback, but from the value of that feedback for improving their performance, as well as from engaging in meta-cognition.

Table 3.5. Stepwise multiple regressions explaining HPSS by workplace learning mechanisms for auditors with high experience

	(1)	(2)	(3)	(4)
<i>Variables</i>				
Gender	0.177 ⁺	0.108	0.137 ⁺	0.121
Office A	0.752***	0.778***	0.741***	0.784***
Office B	0.343**	0.346**	0.334***	0.298**
Task Experience	-0.002	0.001	0.032	0.023
Opportunity for Learning	0.044			0.004
Inquiry & Dialogue	0.154			0.151
Feedback Value		0.082		0.047
Feedback Amount		0.228*		0.095
Meta-Cognition			0.325***	0.288**
<i>Model Summary</i>				
F-value	9.114***	10.171***	14.768***	9.080***
Experience variance	0.000	0.000	0.000	0.000
Learning Variance	0.031	0.058*	0.102***	0.140**
R Square	0.418	0.445	0.490	0.528
Adjusted R Square	0.373	0.402	0.456	0.470

Note: Significance of coefficients indicated as ⁺p<.10, *p<.05, **p<.01, ***p<.001

Table 3.5 finally shows the results for the 'high' experience group. As with the 'medium' group, learning climate is not a significant driver of HPSS. In the overall model, we find that only meta-cognition is significantly relating to HPSS ($\beta = 0.288$, $p = 0.002$). Overall, task experience does not explain any variance, and workplace learning variables explain the smallest proportion of variance among the three groups (14%). In addition to the lower proportion of variance explained by task experience and workplace learning, we notice that the coefficients describing the relationship between office membership and HPSS are especially high and significant in the 'high' experience group. Moreover, in two of the models, the covariate 'gender' significantly relates to HPSS. We explore these unexpected findings further in the following section.

We compare the percentage of variance explained by task experience and each of the three workplace learning mechanisms in figure 3.3. The figure illustrates that the overall variance explained by task experience is highest in the low experience group, and subsequently decreases. Similarly, learning climate explains the most variance in the low experience group, but drops from 7.2% to 3.1% of variance explained for the high experience

group. A different pattern is found for feedback and meta-cognition. Both factors explained the largest amount of variance in the medium experience group (17% and 14.4% respectively), followed by the low experience group (12% and 12.3% respectively) and is lowest in the high experience group (5.8% and 10.2% respectively). These results indicate that workplace learning, and especially feedback and meta-cognition, are significant drivers of skeptical attitudes for auditors of all levels of task experience, but that especially auditors with medium task experience benefit from receiving valuable feedback and from engaging in meta-cognition.

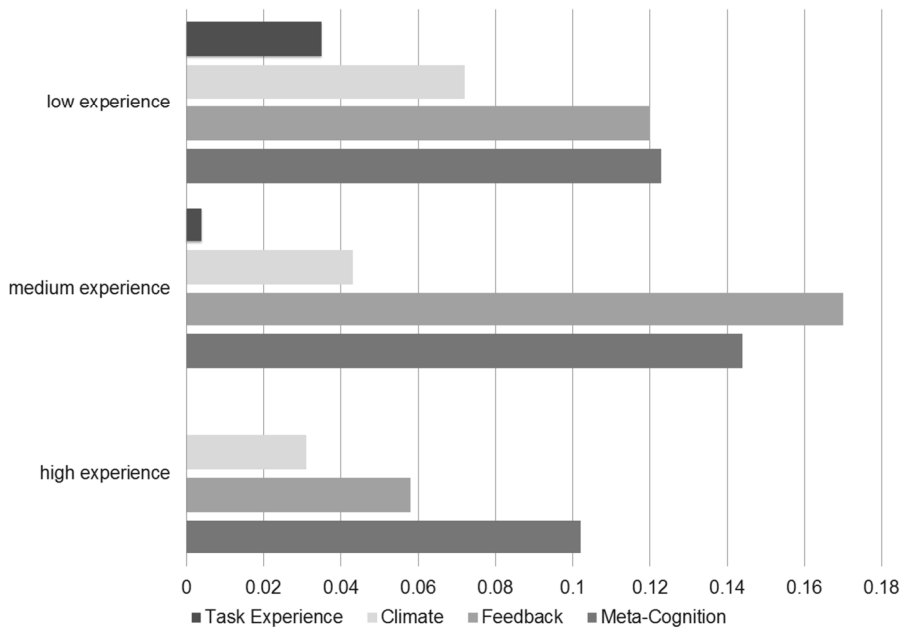


Figure 3.3. Comparison of variance explained (in %) by task experience and workplace learning mechanisms across auditors' experience

Additional Analyses

To gain further insight into the differences between participants from the three offices, as well as to explore the gender effects in the 'high' experience group, we use ANOVA. With respect to the three offices, we find only one significant difference with respect to workplace learning: participants from office A score higher on the value attached to feedback received ($M_A = 4.063$, $SD = 0.496$; $F(2) = 5.075$, $p = 0.007$; $\omega^2 = 0.047$). We do however find four significant differences with respect to HPSS and its subscales. This time, office A scores lower than the other two on 'search for

knowledge' ($M_A = 4.675$, $SD = 0.661$; $F(2) = 37.218$, $p = 0.000$; $\omega^2 = 0.237$), 'suspension of judgment' ($M_A = 4.131$, $SD = 0.861$; $F(2) = 10.824$, $p = 0.000$; $\omega^2 = 0.088$), 'interpersonal understanding' ($M_A = 4.568$, $SD = 0.940$; $F(2) = 46.003$, $p = 0.000$; $\omega^2 = 0.276$), 'confidence' ($M_A = 4.540$, $SD = 0.653$; $F(2) = 14.431$, $p = 0.000$; $\omega^2 = 0.111$), and the overall HPSS scale ($M_A = 131.423$, $SD = 12.217$; $F(2) = 46.958$, $p = 0.000$; $\omega^2 = 0.281$). Based on the data we have collected for this study, we cannot reliably explain the differences between offices. When discussing these findings with members of the participating firm, we derived several potential explanatory factors. Office A is smaller than offices B and C, and these two offices work with larger clients with more industry variance. Future studies on the development of professional skepticism may therefore take these office characteristics into account. Looking at the differences between male and female participants in the 'high' experience group, we find that female participants value the feedback they received more than their male colleagues ($M_f - M_m = 0.255$, $SD_f = 0.323$, $SD_m = 0.463$; $F(1) = 5.431$, $p = 0.022$; $\omega^2 = 0.022$), and they outscore their male colleagues with respect to 'suspension of judgment' of the HPSS scale, ($M_f - M_m = 0.426$, $SD_f = 0.662$, $SD_m = 0.733$; $F(1) = 5.560$, $p = 0.021$; $\omega^2 = 0.052$), 'interpersonal understanding' ($M_f - M_m = 0.572$, $SD_f = 0.960$, $SD_m = 1.032$; $F(1) = 5.000$, $p = 0.028$; $\omega^2 = 0.046$), and the overall HPSS score ($M_f - M_m = 5.850$, $SD_f = 0.11.243$, $SD_m = 12.088$; $F(1) = 3.801$, $p = 0.055$; $\omega^2 = 0.033$). Note that apart from 'confidence', these are the same subscales on which the three offices vary. This reinforces the view that membership of a specific office has shaped the most experienced auditors more than the less experienced ones, and that in turn, future research on professional skepticism may shed further light on this issue by including office as well as individual auditor characteristics.

3.5 | DISCUSSION

Regulators and audit firms regard auditors' professional skepticism as an important condition for making judgments that are based on relevant evidence (AICPA, 1997; FRC, 2015; PCAOB, 2016; Nelson, 2009; Hurtt et al., 2013). It is described as an attitude that influences how auditors collect and interpret audit evidence (AICPA, 1997; Nelson, 2009). This study explored knowledge as a central determinant of auditors' professional skepticism (Hurtt, 2010; Nelson, 2009), by exploring the respective role that task experience and workplace learning mechanisms play in determining auditors' skeptical attitude.

Discussion of Findings

In line with our first hypothesis, we found that task experience is neither a significant nor a substantial driver of auditors' skeptical attitude, with the exception of auditors with low task experience. Variance explained by task experience ranged between 0% (explaining overall HPSS across the entire sample) to 3.5% (explaining overall HPSS in auditors with low experience). These findings are consistent with results by Ashton (1991) and Fathil and Schmidtke (2010), who did not find a significant relationship between task experience and professional skepticism (operationalized as judgments). Our results for hypothesis 1 furthermore relate to Shaub and Lawrence's (1996) inconsistent findings regarding the role of task experience in skeptical behavior. Based on our findings and this study's agreement with earlier results, we conclude that task experience is not a significant explanatory factor of auditors' skeptical attitude. Referring back to the two possible explanations for an absence of a reliable relationship between task experience and skeptical attitude discussed in the introduction, this result alone does not yet allow us distinguish between the trait and the knowledge hypothesis. As proposed by Hurtt (2010), the scale used to measure skeptical attitude may indeed cover non-knowledge, stable characteristics of the individual auditor, rather than an attitude (Carpenter, 2004; Nelson, 2009). Alternatively, task experience may indeed be a poor proxy for knowledge (Bedard, 1989).

The results for our second hypothesis, regarding the relationship between workplace learning mechanisms and auditors' skeptical attitude, allow us to shed further light on this issue. Compared to the low percentage of variance explained by task experience, workplace learning operationalized as auditors' perceptions of their firm's learning climate, the feedback they receive and their tendency to engage in meta-cognition explained between 19.6% (explaining overall HPSS across the entire sample) and 22.6% (explaining overall HPSS for auditors with medium amount of task experience). Specifically, we found that these mechanisms explain the most variance at the individual level (meta-cognition), and the least variance at the firm level (learning climate). The positive relationships between each of the mechanisms and auditors' HPSS scores are in line with findings in the workplace learning literature (e.g. Ashford, 1986; Feltovich et al., 2006; Marsick & Watkins, 2003), and furthermore correspond to studies in which concepts related to each of the three mechanisms are investigated in the audit literature (e.g. Carpenter, 2004; Gronewold, Gold, & Salterio, 2013; Westermann et al., 2015). These positive relationships highlight two key findings; first, taking a workplace learning perspective on the development of auditors' knowledge significantly extends the understanding of how

auditors' skeptical attitudes develops at the workplace (Marsick & Volpe, 1999; Salas & Rosen, 2010). In contrast to task experience, mechanisms of workplace learning appear to be closer proxies for auditors' knowledge, relying on the central role of knowledge in Hurtt et al.'s (2013) and Nelson's (2009) models of antecedents of professional skepticism. Second, it appears that HPSS indeed does not measure only stable traits, but instead reflects auditors' knowledge (rather than experience), meaning that it represents auditors' attitude towards collecting and evaluating evidence (Nelson, 2009). This observation is further discussed in the limitations section below.

Finally, we explored whether auditors with different amounts of task experience benefit from different workplace learning mechanisms in the development of their skeptical attitude. Interestingly, we find that while auditors with medium task experience report slightly lower scores on the workplace learning mechanisms, the variance explained by them is the largest for this group (22.6%). Moreover, the more experience participants had, the less variance was explained by workplace learning mechanisms (14%). These results correspond to Hicks et al.'s (2007) and Westermann et al.'s (2015) finding that auditors who are in the early stages of their career prefer different modes of learning (e.g. online and more social forms of learning). Our findings are also in line with findings by Eraut (2004) and Hofmann et al. (2009), who show that learning may become more individual and less social with more experience in a domain / task. Junior auditors therefore require different support than partners for workplace learning to take place: receiving frequent feedback and engaging in meta-cognitive activities.

To conclude, we find that taking a workplace learning perspective of knowledge development adds significantly to our understanding of (1) how auditors' develop knowledge as part of their everyday work (Eraut, 2004; Marsick & Volpe, 1999; Salas & Rosen, 2010), (2) the role of learning for knowledge development within the existing frameworks of professional skepticism (Hurtt et al., 2013; Nelson, 2009), and (3) the levers that firms can apply to develop their auditors' skeptical attitude.

Limitations and Directions for Future Research

The results of this study are subject to several limitations that need to be taken into account when interpreting the results. First, we chose to use Hurtt's (2010) HPSS to measure skeptical attitude. We found in this study that two sub-scales of the HPSS are relatively unaffected by task

experience or workplace learning mechanisms: self-determining and self-confidence. Yet, two other scales are significantly explained by workplace learning mechanisms: search for knowledge, and questioning mind. By consequence, the scale in its current form may be capturing both knowledge-related and knowledge-unrelated elements of auditors' skepticism. Taking into account the possibly different natures of concepts captured by HPSS may be of value to future studies employing the scale.

Second, regarding the measures for the three learning mechanisms, we rely on self-reported information from participants, which is associated with common biases, such as social desirability. To minimize the effect of these biases, we have relied on previously validated and empirically proven scales from the domain of workplace learning. This study explores whether workplace learning mechanisms explain auditors' skeptical attitude cross-sectionally to establish the existence of the relationships; future research could provide deeper insight into the longitudinal change of skeptical attitude given auditors' experiences. This longitudinal approach would enable us to take into account (1) whether there exists a leveling-off effect with respect to the effectiveness of workplace learning mechanisms, as suggested by our findings for hypothesis 3, and (2) possible selection effects within the firm, which are currently assumed to influence the data, but cannot be parsed out with the current design. Do auditors who do not develop a skeptical attitude drop out? Do auditors who learn more from workplace experiences advance better within the firm?

A third limitation is inherent in our sampling strategy. We focused on several offices within the same Big 4 firm in order to allow for variance in e.g. the learning climate measures within a frame that holds a series of factors constant (e.g. procedures, trainings, responsibilities at functions levels). This strategy limits the generalizability of findings, but also reduces noise (Eraut, 2000) as evidenced by the significant covariate of office membership. Auditors' skeptical attitude appears to be a highly contextualized factor that reflects auditors' social environment within their team / office / firm.

Fourth, the current sample of three offices of one Big 4 firm allows us to conduct a subgroup analysis, but is insufficient for a complete multilevel approach towards data analysis (Heck, Thomas, & Tabata, 2014). Multilevel modeling allows accounting for the nested nature of audit data, with factors explaining variance at the individual, leader and firm level, and in turn allows comparing the variance explained at several levels simultaneously. Future studies that are able to cover a minimum of eight to ten locations / offices at

the highest level (van Duijnen, Van Busschbach, & Snijders, 1999) may benefit significantly from taking a multilevel approach to explaining variance.

Finally, the design and methods of this study offer several opportunities for future research. Operationalizing professional skepticism as an attitude as well as judgments and actions, it would be interesting to find out whether there is a direct relationship between task experience and workplace learning with skeptical judgments / actions, or whether the relationship is mediated by auditors' skeptical attitude. Additionally, given the significant variance explained by social experiences and workplace learning, could professional skepticism be 'contagious'? Are junior auditors developing a more skeptical attitude when working with a skeptical manager or partner? Another set of questions emerges from taking a workplace learning perspective towards auditors' knowledge development. Based on Westermann et al.'s (2015) findings, workplace learning promises to affect not only professional skepticism, but may also be positively related to other desirable outcomes, such as auditors' judgments, actions and interpretations of evidence, calling for observable behavior as outcome measures. Moreover, given the cross-sectional findings on task experience effects in this study, a longitudinal approach towards measuring the relationship between professional skepticism and workplace learning may address several questions; for example, do auditors change learning strategies to adapt to demands by different clients, supervisors or regulations? Do learning mechanisms leverage the effect of different types of audit experience, such as fraud- or error-, client- or industry-specific experience? Does workplace learning enable auditors to use existing procedures more efficiently?

Implications for Audit Practice

Implications for practice of this study root in the malleable character of the independent variables. As a consequence, audit firms can actively support the process of learning from workplace experience to develop their employees' skeptical attitude. In our view, audit firms can actively steer each of the three workplace learning mechanisms so that auditors can effectively learn as part of their daily work. On the individual auditor level, the learning process can be facilitated by providing guidance and time for reflection. For this support to be effective, two conditions need to be met: (1) supervisors need to know how to guide their team members in reflection and (2) time provided for learning may not add to auditors' time pressure or work load. Both conditions rely on the behavior of the supervisor.

On the supervisor level, knowledge about how and when to encourage meta-cognition and how to provide feedback can encourage the exchange of information that is crucial for auditors to continuously acquire relevant knowledge. For supervisors to engage in this behavior, they need to be convinced that both short-term efficiency as well as ongoing performance improvement matter to the firm. Signaling this value could be expressed informally in interaction with team leaders, as well as formally, e.g. as part of the yearly assessment cycle and in promotion decisions. Again, these challenges can only be addressed when learning is consistently valued at the firm level.

Therefore, the main challenge at the firm level is the design of the firm environment for effective workplace learning. A supportive climate facilitates the exchange of valuable feedback, rewards the engagement in meta-cognitive activity, and therefore should be firms' first point of attention to facilitate workplace learning. Research on drivers of learning climate have identified leadership as a key factor (Cha & Edmondson, 2006; Tucker & Edmondson, 2003): the behavior that members of an organization can observe in their leaders sets the tone for what is acceptable and unacceptable behavior in a given social environment. By implication, leaders possess a unique ability to shape a firm's climate: sharing their own learning experiences, rewarding their team's learning efforts, providing room for the undertaking of learning activities and sharing the gained insights are all observable, and therefore powerful ways to encourage all members to engage in ongoing learning at the workplace (Cha & Edmondson, 2006; Clarke, 2006; Edmondson, 2012).

Taking a workplace learning approach to understanding the development of skeptical attitude also has implications for the use of other antecedents of skeptical judgments and actions. For example, professional skepticism may not be a valid selection tool (Frag & Elias, 2012), as the development of the attitude may rely less on the baseline level and more on the individuals' engagement in workplace learning. A key antecedent of skeptical judgments and actions (as well as traits) proposed by both Hurtt et al. (2013) and Nelson (2009) are incentives. Based on the central role that auditors' knowledge plays in both models of professional skepticism as well as in the analysis of this study, incentives' effectiveness may depend on the amount of knowledge that an auditor possesses. As a consequence, increasing auditor's accountability or changing bonuses may not be effective in bringing about skeptical judgments and actions, unless the auditor possesses the necessary knowledge to display a skeptical attitude.

Of course, encouraging workplace learning requires resources from the firm, mostly time that is integrated with each engagement as well as outside specific client-related activities. As such, time spent on learning, as integrated with work as it is, is not inherently 'billable', and therefore challenges firms' reliance on efficiency for generating profit. Since all firms are applying this business model, deviating from it creates significant risks: the competition between firms on budgets acts as a strong inhibitor for long-term activities. Here, oversight bodies and regulators may play a positive role in creating incentives for learning that apply to all firms, easing the competitive pressure at this point. Incentives to foster workplace learning need to be positive, e.g. by rewarding learning efforts and helping firms to communicate their learning climates to clients and future staff. Punishing the absence of learning, just like the occurrence of deficiencies, may create a climate of fear that could lead to an increased focus on short-term procedures over long-term understanding (Piersma, 2015), defeating the purpose.

This implies that to enable auditors to make judgments under uncertainty, audit firms can design a work environment (1) in which auditors are able to address uncertainty through the continuous development of relevant knowledge, (2) in which auditors are able and encouraged in undertaking workplace learning through a supportive learning climate, receiving frequent and valuable feedback, and through engaging in meta-cognitive activities, and (3) in which incentives lever auditors' knowledge, instead of punishing its absence.

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PART II

LEVERAGING JUDGMENT QUALITY
THROUGH LEARNING FROM ERRORS

CHAPTER 4

SUPPORTING AUDITORS' LEARNING FROM THEIR OWN ERRORS: A SOCIAL NETWORK PERSPECTIVE

"He who knows best knows how little he knows"
- Thomas Jefferson

ABSTRACT

To ensure a high quality hierarchical review process and high performance over time, audit firms need to support staff after they make an error. This study explores how audit firms can support seeking help after an error in order to learn from it by looking at auditors' help-seeking behavior as determined by the firm's learning from error climate, the characteristics of their network, and individuals' predispositions towards handling errors. Through a survey with 157 auditors we find that participants seek help most frequently from direct colleagues, and that the learning value of help received depends on the firm's learning from error climate and accessibility of higher hierarchical levels. Individual predispositions towards handling errors did not explain the undertaking of help-seeking. These findings show that audit firms can actively design the work environment to foster not only the reporting of errors, but especially the learning from errors.

This chapter is based on Grohnert, T., Meuwissen, R.H.G., & Gijssels, W.H. (under review). Supporting Auditors in learning from their errors: A social network perspective. *Behavioral Research in Accounting*.

4.1 | INTRODUCTION

Managing auditors' own errors is a key determinant of the audit process (e.g. Gold, Gronewold, & Salterio, 2014; Gronewold & Donle, 2011). Putz, Schilling and Kluge (2012, p. 108) define an error as a "deliberate action (or deliberate omission of actions) characterized by the unintended failure to achieve a personal goal and/or the unintended deviation from organizational norms and goals which could have been avoided by alternative behaviors of the acting person". Given that errors are inevitable (e.g. Rybowskiak, Garst, Frese, & Batinic, 1999; van Dyck, Frese, Baer, & Sonnentag, 2005), managing them means acknowledging their occurrence, reporting them, and preventing the same error from occurring again (Frese & Keith, 2015; Gold et al., 2014; Gronewold & Donle, 2011). Therefore, learning from errors is an important component of error management, "the ability to prevent errors in the long term by learning from them, planning, and changing work processes" (Rybowskiak et al., 1999, p. 543).

Prior research on error management in auditing has focused on two types of errors: errors made by clients that auditors need to detect (Bonner, Libby, & Nelson, 1997; Bonner & Walker, 1994; Nelson, 1993; Owosho, Messier, & Lynch, 2002), and, more recently, errors auditors make themselves during the audit process (Gold et al., 2014; Gronewold & Donle, 2011; Gronewold, Gold, & Salterio, 2013; Perreault, Wainberg, & Luippold, 2012; Stefaniak & Robertson, 2010). This second stream of research has focused on auditors' reporting of errors, while research on how auditors learn from their own errors has received limited and mostly implicit attention in audit research (Gronewold & Donle, 2011). However, effective management of auditors' own errors necessitates both reporting as well as learning from errors (Frese & Keith, 2015; van Dyck et al., 2005).

Research in the domains of management and workplace learning shows theoretically as well as empirically, that reporting and learning from errors are distinct concepts that are only conditionally related (Bauer & Mulder, 2013; Edmondson, 2012; Edmondson, 2011; Rybowskiak et al., 1999). For example, both Tucker and Edmondson (2003) as well as Bauer and Mulder (2013) find that some nurses report their errors to colleagues in order to cope emotionally with the experience, but without engaging in learning. Studies across domains such as business, healthcare and education have found that learning from errors only takes place when facilitated through the firm's learning from error climate (Cannon & Edmondson, 2005; Edmondson, 2012; Tucker & Edmondson, 2003; Zhao & Olivera, 2006). Learning from error climate is defined as "the collective perceptions of the members of an organization or organizational unit concerning practices,

processes, structures, and behaviors that support or hinder the benefit that organizations can draw from errors" (Putz et al., 2012, p. 112). In the workplace learning literature, evidence shows that in a supportive learning climate, nurses only engage in learning activities after sharing their errors with colleagues (Bauer & Mulder, 2013; Tucker & Edmondson, 2003). In the audit literature, climate has previously been related to the reporting of errors (Gold et al., 2014; Gronewold et al., 2013; Perreault et al., 2012; Stefaniak & Robertson, 2010), showing that the environment in which errors occur determines how they are managed at the individual level. However, currently the question of how audit firms can foster learning beyond reporting of errors is understudied. In their study of how auditors learn as part of their work, Westermann, Bedard and Earley (2015, p. 890) find that in auditing, "effective learning is a long, complex, multifaceted, and integrated process that achieves success through a delicate balance of specific conditions in order to nurture development". In this study we therefore investigate how audit firms can support their members' learning behavior after making an error through providing a supportive learning climate, taking into account that learning is social and dependent on individual auditors' characteristics.

Addressing this research question adds to existing research in several ways. First, learning is treated as a separate concept from reporting and is studied in line with validated research methodology in the workplace learning literature (Edmondson, 2012; Rybowskiak, Garst, & Frese, 1999; van der Rijt et al., 2013): social network analysis (Cross & Sproull, 2004; Hatala, 2006; Morrison, 2012). Second, we look at predictors at two different levels; at the level of interactions between individuals after errors, we study the characteristics of colleagues that make up an auditors' social network; at the level of the individual auditor, we study their individual predispositions as well as the perceptions of their firm's learning from error climate. Third, this study investigates participants' perceptions of the social environment within their own firm, complementing manipulation-based studies. Finally, we focus on junior auditors' learning from errors, because junior auditors carry out critical audit procedures (Plumlee, Rixom, & Rosman, 2015; Stefaniak & Robertson, 2010) that serve as inputs for the hierarchical review process (Owhoso et al., 2002). Errors made at the junior level can escalate through the team's checks, possibly resulting in a faulty audit report (Owhoso et al., 2002). At the same time, junior auditors are still acquiring their professional knowledge (Westermann et al., 2015). Developing a better understanding of how audit firms can support their learning from errors at these different levels may contribute to improving future audits. Audit firms can (1) actively manage their learning climate through leadership and modeling desirable behaviors, (2) develop their staff's professional networks through conscious

team design and (3) take into account their staff's individual differences with respect to error management. By designing a work environment conducive to learning from errors in this manner, audit firms can tap the potential to continuously improve performance as part of daily, already established practice.

In this study, 157 junior auditors from eleven different audit firms (including all Big 4 firms) took part, reporting a total of 718 social relationships they engage in to seek help after errors. The dependent variables in this study are the participants' interactions within their social networks at work after an error: the number of individuals contacted, the frequency of seeking help after an error and the learning value of the help received after an error (building further on van der Rijt et al., 2013). As explanatory factors, we look at two levels. At the level of the help-seeking interaction, we take into account characteristics of the contacts asked for help, specifically their relative hierarchy and their accessibility (van der Rijt et al., 2013). At the level of the individual auditor, we assess auditors' error orientation (Rybowiak et al., 1999) as a means to take into account individual differences in error management, as well as the influence of audit firms' learning from error climate (Putz et al., 2012). All variables are measured through a questionnaire, given they are either latent or not directly observable. We use multilevel analysis in order to distinguish variance explained by the help-seeking interactions from variance explained by characteristics of the individual auditor. Our results indicate that auditors seek help predominantly from colleagues they work with very closely, e.g. in the same teams. Regarding the learning value of the help obtained, we find positive effects for the firm's learning from error climate, relative hierarchy and accessibility. Effects at the network level are strongest in this study. Individual effects were crowded out, indicating that the social firm environment is a stronger determinant of learning from error behavior than individual predispositions.

4.2 | HYPOTHESIS DEVELOPMENT

Junior auditors not only carry out crucial tasks in the hierarchical review process (Owhoso et al., 2002), but at the same time they are still learning the ropes of the profession, meaning they do not perform at the same level of managers and partners (Plumlee et al., 2015). Errors are therefore likely to occur in the junior auditors' work, requiring them to manage them effectively (Gronewold & Donle, 2011; Rybowiak et al., 1999; van Dyck et al., 2005). Edmondson (2012; 2011) specifies that learning from errors is a social process that is achieved best when diverse knowledge within a team

or firm is used by sharing error experiences and analyzing them together. At the same time, this social process of learning from errors bares risks for the person admitting to an error, such as being blamed (van Dyck et al. 2005), being perceived as incompetent (Edmondson, 2012), and facing uncertainty in situations of competition and promotion (Rybowiak et al., 1999). These negative emotions can be a powerful barrier to learning from errors that need to be overcome by audit firms by actively facilitating learning (AICPA, 2010; Gronewold & Donle, 2011; Rybowiak et al., 1999).

Learning from Errors through Help-Seeking

In this study, we look at learning activities undertaken by auditors after experiencing an error by taking into account the following two perspectives. First, we focus on social learning activities, in line with the definition of error management by Frese and Keith (2015) and Edmondson (2012) stating that especially in complex operations, learning requires diverse insights and knowledge. Second, we focus on seeking help after an error occurred based on Bamberger's (2009) work showing that help seeking is highly effective when a specific problem forms the basis for learning, as is the case in error management. In addition, help seeking has been found to be among the most relevant characteristics of a highly productive workplace according to a survey of 400 American companies by the Wall Street Journal (Shallenbarger, 2000). Bamberger (2009, p. 51) defines help-seeking behavior as "an interpersonal process involving the solicitation of the emotional and instrumental assistance of a work-based colleague (i.e. a peer, supervisor or sub-ordinate) to manage some problem either at or outside of work". Bamberger (2009, p. 52) further specifies that "for an action to qualify as help-seeking there must be (a) a problem or difficulty for which one hopes to find relief or some remedy, (b) at least two parties with one party soliciting the assistance of the other in what is fundamentally an interpersonal interaction, and (c) proactive action on the part of the help-seeker to gain the desired relief or remedy". Help seeking is often operationalized using social network analysis in which frequency and quality of interactions between members of a certain group or unit is measured (Borgatti & Cross, 2003; Hatala, 2006). Following van der Rijt et al. (2013) and Cross and Sproull (2004), we investigate the frequency with which auditors seek help after discovering they made an error, as well as the quality of the help they received.

Social network analysis considers help-seeking frequency as an indicator of how acceptable it is to seek help within a firm (Hofmann, Lei, & Grant, 2009; van der Rijt et al., 2013). Prior research has shown a curvilinear relationship

between help-seeking frequency and (perceived) performance (Nadler, Ellis, & Bar, 2003). The 'optimum' depends on the acceptability of help-seeking in the specific context (Bamberger, 2009). We therefore expect that a high help-seeking frequency is indicative of learning from errors. Next, we look at the quality of the help received for the goal of learning from errors: the value of the help received for learning from errors. Van der Rijt et al. (2013) report a positive relationship between seeking help of high learning value and performance in the Finance and Management Control domain. We assume that auditors asking help from colleagues they know are more knowledgeable about the topic is indicative of targeted learning.

Supporting Help-Seeking in the Audit Firm Environment

It is essential to understand which factors influence the degree and quality to which auditors seek high-quality help within the firm. To encourage help seeking, audit firms need to overcome the negative connotations of experiencing an error, so as to provide a suitable environment not only for reporting, but actually learning (Edmondson, 2012; 2011). To address this challenge, audit firms need to (1) lower the perceived social risk of communicating about errors (Edmondson, 2012; 2011), and (2) make valuable help as easily accessible as possible (Bamberger, 2009; Frese & Keith, 2015). We propose that these challenges can be overcome through a supportive help-seeking network and through personal characteristics of the auditor (Rybowiak et al., 1999; van der Rijt et al., 2013). We also expect these processes to be dependent on the degree to which a firm's learning from error climate is supportive of help-seeking (Putz et al., 2012).

Network-Level Predictors: Help Network Characteristics

Seeking help after making an error is heavily dependent on the availability of help within auditors' social networks. Past research has shown that help-seeking behavior is dependent on the characteristics of the contacts (ties) that individuals seek help from. Interactions within social networks are affected by hierarchy and accessibility of ties (Bamberger, 2009; Hofmann et al., 2009; Morrison, 2002). In line with van der Rijt et al. (2013) findings we propose that seeking help from colleagues of higher hierarchical rank, but with low accessibility is indicative of targeted learning after an error. Asking hierarchically superior colleagues increases the chance to receive valuable help based on the person's superior experience and knowledge (Bamberger, 2009), which in turn supports learning. The opposite is true for asking help from colleagues on the same hierarchical level: they may not possess more knowledge, but the low(er) social costs support emotional coping (Bamberger, 2009; Morrison, 2002). The next characteristic of

auditors' help network is accessibility of help. Van der Rijt et al. (2013) look at accessibility in terms of frequency of collaboration. High accessibility is associated with lower costs, making help-seeking more likely (Hofmann et al., 2009). Tucker and Edmondson (2003) identified learning from error behavior only when nurses turned to hierarchically superior colleagues. Seeking help from same-level colleagues supported emotional coping, but was not associated with learning. This leads to our first hypothesis:

- H1a: Auditors who seek help from hierarchically superior ties as well as from inaccessible ties will seek help more frequently.
- H1b: Auditors who seek help from hierarchically superior ties as well as from inaccessible ties will obtain help of higher learning value.

Individual-Level Predictors: Error Orientation

To control for individual differences in help-seeking, we include two factors: auditors' predispositions towards communicating and learning from errors. Rybowski et al. (1999) define an individual's error orientation as a learned attitude towards errors that is influencing behavior across different errors. Rybowski et al. (1999) present two attitudes that relate to this study: the predisposition towards covering up errors, and the predisposition towards learning from errors. We assume a positive relationship between an individual auditor's error orientation and their help-seeking behavior after an error, leading to our second hypothesis:

- H2a: Auditors with a low predisposition towards communicating about errors and a high predisposition towards learning from errors will seek help more frequently.
- H2b: Auditors with a low predisposition towards communicating about errors and a high predisposition towards learning from errors will obtain help of higher learning value.

Moreover, we expect that help-seeking within the network is depending on the firm's learning from error climate. Putz et al.'s (2012) definition of learning from error climate as well as Jenkins, Deis, Bedard and Curtis (2008, p. 47) work states that climate "establishes the parameters of acceptable and unacceptable behavior". Studies by Perreault et al. (2012), Gronewold et al. (2013) and Gold et al. (2014) have found a positive relationship between a supportive error climate and reporting errors.

Outside of auditing, substantial work has been done on the influence of organizations' climate on individuals' learning from error. Evidence from healthcare (Edmondson, 1996; Tucker & Edmondson, 2003) and aviation (Helmreich, 2000) shows a positive relationship between a firm or unit's climate and long-term learning from errors. Carmeli and Gittell (2009) find that when professionals - across a range of domains - felt they could talk about errors without fearing negative consequences, they showed more learning from errors behavior. We therefore expect that a firm's learning from errors climate is associated with higher learning from error, leading to our final hypothesis.

H3a: Auditors who perceive a more supportive learning from error climate will seek help more frequently.

H3b: Auditors who perceive a more supportive learning from error climate will obtain help of higher learning value.

4.3 | METHODS

Settings, Procedure and Participants

Data for this study were collected during mandatory training programs attended by Dutch junior auditors as part of their audit certification, totaling 173 participants. These sessions are attended by auditors from different firms. Work experience ranges from one to 36 months, with an average of 10.31 months. Participants worked for eleven different audit firms, with 86.11% of participants working for one of the Big 4 firms; 64% of the participants are male. All participants filled in an online questionnaire in the presence of a researcher, making the response rate 100%. Sixteen participants were excluded prior to analysis because they had worked at their firm less than one month, which did not allow them to fill out the survey items reliably. The working sample for this study therefore comprises 157 junior auditors. Through the inclusion of all attendants of the mandatory training sessions, participants could not self-select into participation, limiting sample bias.

We chose to base the data collection on participants' actual experiences within their own working environment for two reasons. First, junior auditors have limited experience within audit firms, making it unlikely that they had experienced different climates and networks. Therefore, it is unlikely they

would respond to manipulations of either factor based on their own professional experience (Berry, Shanks, Speekenbrink, & Henson, 2012; Tulving & Schacter, 1990), limiting validity. Second, while we cannot derive causal relationships from the social network design, we gain insight into actual dynamics at the workplace, helping us to formulate specific implications for audit firms to foster their juniors' learning from errors. To this end, each participant was asked to think of a recent error (as defined by Putz et al., 2012) they had made in their own work before completing the questionnaire detailed below. In line with Rybowski et al. (1999), providing this frame of specific instances improves recollection and in turn reporting accuracy.

Operationalization of the Dependent Variables

The dependent variables in this study, *frequency and learning value of help-seeking*, are operationalized following social network analysis methodology. Social network analysis (Borgatti & Cross, 2003) is used to measure auditors' help-seeking behavior, building further on van der Rijt et al. (2013). Social network analysis is an established tool to investigate interactions between individuals with a specific purpose (Hatala, 2006; Hatala & Fleming, 2007; Scott, 2013). We follow van der Rijt et al.'s (2013) methodology for capturing individuals' ego-networks (Cross & Sproull, 2004; Morrison, 2002).

With the goal to study help-seeking in response to experiencing an error, we formulated the following prompt for participants to generate relevant ties: "when you experience an error or mistake at work, who do you typically turn to for help and advice? Please indicate the initials or first names of the most relevant persons". We chose to include the term error as well as mistake in the prompt, as they are frequently used interchangeably in practice (Edmondson, 2012) and would be used more or less frequently across firms. Subsequently, we provided ten slots for participants to indicate ties, the average of Morrison's (2002) maximum number of ties reported in her pilot interviews, and the observed maximum of ties as indicated in the research by van der Rijt et al. (2013). For each subsequent question, the ties named in response to the prompt are reproduced, and participants evaluate the characteristics of each tie in turn. For the dependent variables, participants indicated for each tie how often they seek help from this person, ranging from (almost) never to very often, and in how far the help they received from this tie contributed to their learning, ranging from 'does not contribute at all' to 'contributes a lot'.

Operationalization of the Independent Variables

Help-seeking network characteristics were measured with two additional network questions following the prompt for the other two network questions making up the dependent variables. Participants indicated for each tie whether they worked at a lower, the same, or a higher hierarchical level, resulting in a categorical variable with four values to operationalize relative hierarchy. In addition, participants indicated how often they worked together with each tie outside of seeking help, ranging from (almost) never to very often, a scale-variable operationalizing accessibility of help.

Auditors' *predispositions to cover up and learn from errors* are measured through previously validated 4-item Likert-type scales taken from Rybowski et al.'s (1999) error orientation questionnaire, in line with Gronewold and Donle (2011). The covering up errors scale contains items such as "why mention a mistake when it is not obvious?" and "it is disadvantageous to make one's mistakes public", and has a Cronbach alpha of .669. The learning from errors scale contains items such as "mistakes assist me to improve my work" and "mistakes provide useful information for me to carry out my work", with a Cronbach alpha of .853. Moreover, participants' gender, months of task experience and firm were recorded.

Organizational *learning from error climate* was measured using Putz et al.'s (2012) short version of the organizational learning from errors (OLE) questionnaire. The 16-item scale contains items such as "employees in our work group know how to get the information they need to correct errors" and "when someone in our work group makes a mistake, other co-workers will help him/her to fix it". The scale has a high reliability with a Cronbach alpha of 0.886.

Analysis

The data collected for this study are nested: characteristics and perceptions of the individual auditor are expected to influence the nature of help-seeking behavior with different ties. To account for this nested data structure, multilevel modeling is used to discern the relative influence of variables across these two levels, as well as the relative amount of variance explained (van Duijnen, van Busschbach, & Snijders, 1999). In our analysis, we follow the analysis strategy suggested by Heck, Thomas and Tabata (2014). In a first step, a null model is calculated to understand variance at the two levels of analysis when only taking into account the dependent variable. Second, independent variables at the different levels are added

separately to the null model to understand their relative contribution to explaining both types of variables (model 1-3). In a final step, all variables are included at the same time to understand their simultaneous effect (model 4). To evaluate the effectiveness in explaining variance, models calculated in steps 2 and 3 are compared to the null model. Before the analysis, all individual level variables were grand mean centered and scores of participants from different firms on these different variables were explored using ANOVA. We find small differences with respect to the network characteristics as well as learning from error climate. Because these differences showed low effect sizes ranging from $\omega^2 = 0.027$ and $\omega^2 = 0.047$, we chose not to include firm membership as another level in the analysis.

4.4 | RESULTS

Descriptive Results

In total, this survey covers 718 ties. On average, participants reported to contact 4.484 ties after experiencing an error (SD = 2.493), asking for help either several times a week or daily (M = 3.582, SD = 1.062), and that the help obtained provides a positive value for learning (M = 4.143, SD = 0.805). The learning from error climate was reported to be mostly supportive (M = 4.488, SD = 0.622), and on average, help was sought from colleagues of the same hierarchical level, with a slight upward orientation (M = 2.681, SD = 0.718), and from colleagues that participants work with 'sometimes' to 'frequently' (M = 2.724, SD = 0.682). Finally, participants provided a low disposition to cover up errors (M = 1.910, SD = 0.644) and a high disposition to learning from errors (M = 4.191, SD = 0.523).

Explaining Help-Seeking Frequency

To investigate whether help-seeking frequency is explained by the tie-level predictors of hierarchy and accessibility (hypothesis 1a), by the individual-level predictors of error orientation (hypothesis 2a) and perceived learning from error climate (hypothesis 3a), we developed a multilevel model. Table 4.1 reports the results for the first part of our three hypotheses. The null model estimates variance at the two levels of analysis, tie level and individual level, providing a baseline for evaluating models 1 to 4. The interclass correlation (ICC) of 0.385 indicates that variance between

individual auditors is larger than between ties, warranting the multilevel approach.

Model 1 adds the variables at the tie level: relative hierarchy and accessibility. Participants indicated to seek help more frequently when they could contact colleagues at the same hierarchical level ($\hat{\gamma} = 0.570$, S.E. = 0.244), and when they could contact colleagues whom they work with frequently ($\hat{\gamma} = 0.720$, S.E. = 0.041). Model 1 is a significant improvement over the null model, as indicated by the comparison of the -2 log likelihoods ($X^2(2) = 301.298$, $p < 0.000$). Using Heck et al.'s (2014) approximation of variance explained $[(\text{level 1 variance}_{\text{null}} - \text{level 1 variance}_1) / \text{level 1 variance}_{\text{null}}]$, we find that tie-level predictors explain an addition 24.2% of variance. These findings provide support for hypothesis 1a.

Model 2 explores the influence of individual-level predispositions towards covering up errors and learning from errors. Only the predisposition to cover up errors significantly (and negatively) explains the frequency of help-seeking ($\hat{\gamma} = -0.351$, S.E. = 0.120), also presenting a significant improvement over the null model, if to a smaller degree than model 1 ($X^2(2) = 9.653$, $p < 0.000$, change in proxy for $R^2 = 0.098$). This provides partial support for hypothesis 2a.

Model 3 in turn uses a firm's perceived learning from error climate as a predictor of help-seeking frequency. While the estimated coefficient is not significant ($\hat{\gamma} = 0.247$, S.E. = 0.315), the model is a significant improvement over the null model, again to a lesser degree than model 1 ($X^2(1) = 5.687$, $p < 0.025$, change in proxy for $R^2 = 0.061$). This finding represents weak support for hypothesis 3a. In a final step, we estimate the complete model, which is a significant improvement over the null model ($X^2(6) = 305.130$, $p < 0.000$), explaining an additional 27.4% of variance in the frequency of help-seeking.

As expected based on models 1 to 3, tie-level predictors crown out effects at the individual level. Auditors seek help frequently when they can contact their immediate colleagues who are employed at the same hierarchical level. Individual predispositions and the firm's learning from error climate play a minor role in encouraging frequent help-seeking.

Table 4.1. Model estimates for the two-level analyses of the frequency of help-seeking

	Null Model		Model 1		Model 2		Model 3		Model 4	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
<i>Fixed Effects</i>										
Intercept	3.557***	0.082	1.412***	0.250	3.543	0.791	3.558	0.081	1.455	0.251
<i>Level 1 Predictors: Tie Characteristics</i>										
Lower Hierarchy			-0.312	0.513					-0.323	0.513
Same Hierarchy			0.570*	0.244					0.542*	0.244
Higher Hierarchy			0.121	0.242					0.091	0.242
Accessibility			0.720***	0.041					0.713***	0.041
<i>Level 2 Predictors: Individual Characteristics</i>										
Covering Up Errors					-0.351**	0.120			-0.139	0.113
Learning from Errors					0.143	0.156			0.035	0.153
Learning from Error Climate							0.310	0.128	0.104	0.134
<i>Random Effects</i>										
Level 2 Variance	1.130***	0.068	0.739***	0.045	1.132***	0.068	1.132***	0.068	0.74	0.045
Level 1 Variance	0.071***	0.115	0.537***	0.086	0.639***	0.156	0.664***	0.111	0.514	0.084
-2 Log Likelihood	2269.515		1968.217		2259.862		2263.828		1964.385	
-2LL test			Chi ² (3)=301.298***		Chi ² (2)=9.653**		Chi ² (1)=5.687*		Chi ² (6)=305.130***	
Proxy for R Square Change			0.242		0.098		0.061		0.274	

Note: parameter estimates are shown with their standard errors; significance is indicated as *p < 0.10, **p < 0.05, ***p < 0.001

Table 4.2. Model estimates for the two-level analyses off the learning value of help received

	Null Model		Model 1		Model 2		Model 3		Model 4	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
<i>Fixed Effects</i>										
Intercept	4.170**	0.059	2.679***	0.190	4.158	0.057	4.172	0.058	2.701	0.191
<i>Level 1 Predictors: Tie Characteristics</i>										
Lower Hierarchy			0.150	0.391					0.143	0.391
Same Hierarchy			0.362*	0.186					0.341*	0.186
Higher Hierarchy			0.677***	0.184					0.654***	0.184
Accessibility			0.338***	0.031					0.333***	0.031
<i>Level 2 Predictors: Individual Characteristics</i>										
Covering Up Errors					-0.260**	0.087			-0.104	0.087
Learning from Errors					0.031	0.111			-0.030	0.117
Learning from Error Climate							0.209*	0.092	-0.030	0.117
<i>Random Effects</i>										
Level 2 Variance	0.556***	0.033	0.430***	0.026	0.556***	0.033	0.556***	0.033	0.430***	0.026
Level 1 Variance	0.356***	0.055	0.307***	0.047	0.336***	0.052	0.349***	0.054	0.296***	0.000
-2 Log Likelihood	1763.978		1578.552		1754.971		1758.916		1574.415	
-2LL test			Chi ² (2)=185.426***		Chi ² (2)=9.007*		Chi ² (1)=5.062**		Chi ² (6)=189.562***	
Proxy for R Square Change			0.191		0.081		0.043		0.190	

Note: parameter estimates are shown with their standard errors; significance is indicated as *p < 0.10, **p < 0.05, ***p < 0.001

Explaining Learning Value from Help Received

The same analysis as presented above is carried out to explore in how far the learning value from help sought is explained by tie-level factors (hypothesis 1b), individual predispositions (hypothesis 2b) and the firm's learning from error climate (hypothesis 3b). Results are reported in table 4.2. The null model, the baseline, reveals that significant variance exists both between individuals and between ties, resulting an ICC of 0.396.

Model 1 explores hypothesis 1b, looking at tie-level predictors of relative hierarchy and accessibility. Help is perceived to be most valuable for learning when sought from colleagues at the same hierarchical level ($\hat{\gamma} = 0.365$, S.E. = 0.186), from colleagues at higher hierarchical levels ($\hat{\gamma} = 0.677$, S.E. = 0.184), as well as from easily accessible colleagues ($\hat{\gamma} = 0.336$, S.E. = 0.031). With an additional 19.1% of variance explained, Model 1 represents a significant improvement over Model 2 ($X^2(2) = 185.426$, $p < 0.000$). This provides us with strong support for hypothesis 1b.

Model 2 and 3 show the relationships between individual-level factors on learning value of help received. Model 2 shows that the predisposition of covering up errors negatively explains learning value ($\hat{\gamma} = -0.260$, S.E. = 0.087), and Model 3 shows a positive relationship for learning from error climate ($\hat{\gamma} = 0.209$, S.E. = 0.092).

Both models are improvements over the null model, but explain less variance than model 1 ($X^2_2(2) = 9.007$, $p < 0.025$; $X^2_3(1) = 5.062$, $p < 0.010$). These findings provide support for hypotheses 2b and 3b. Model 4, the overall model, reveals a similar pattern, explaining help-seeking frequency. The improvement over the null model is significant ($X^2(6) = 189.562$, $p < 0.000$, variance explained 19%). Again, effects at the tie level crowd out effects at the individual level. Auditors seek valuable help from easily accessible colleagues, especially from higher hierarchical level, and to a lesser degree also from colleagues of the same level.

4.5 | DISCUSSION

In this study we investigate auditors' help-seeking after an error as a function of factors on the firm, network and individual level. The present study adds to existing research by explicitly focusing on the learning component of error management and focusing on auditors' actual experiences within their respective firms (Bauer & Mulder, 2013; Edmondson, 2011). Building on theory and empirical findings from the

domains of workplace learning and healthcare, this study uses previously validated measures of learning as help seeking behavior, the learning from error climate (Putz et al., 2012), characteristics of network ties (van der Rijt et al., 2013) and an individual's error orientation (Rybowiak et al., 1999).

We find that auditors who sought help most frequently did so with their immediate colleagues on the same hierarchical level. This is in line with findings by Bamberger (2009) and Tucker and Edmondson (2003). According to both Bamberger (2009) and Tucker and Edmondson (2003), this behavior pattern is indicative of high social costs and low learning and was previously found in firms with an unsupportive or inconsistent climate. In line with our second hypothesis, the predisposition towards covering up errors is negatively related to the frequency of help-seeking; auditors who tend to cover up errors also seek less help to learn (Rybowiak et al., 1999). Contrary to our expectations, auditors' self-reported predisposition towards learning from error is not a significant predictor of help-seeking frequency. This finding could be related to earlier observations that declared values within an organization are not necessarily related to behavior (Cha & Edmondson, 2006), or could be related to a social desirability bias in participants' responses. Next, in line with our hypothesis 3 we find that a firm's learning climate is a significant facilitator for seeking help of high learning value, in line with earlier findings by e.g. (Edmondson, 1996; 2004; Hetzner, Gartmeier, Heid, & Gruber, 2011; Leicher, Mulder, & Bauer, 2013; Tucker & Edmondson, 2003).

Moreover, we find that the characteristics of the ties significantly explain the learning value of the help received, in line with findings by van der Rijt et al. (2013). The finding that help is valued from different hierarchical levels more than from the same hierarchical level indicates that auditors do undertake learning-related activities after experiencing an error: they seek help from individuals they know will provide valuable help. The observation that help-seeking frequency and learning value are differently explained by organizational and network characteristics reinforces that reporting and learning from errors as separate concepts (Bauer & Mulder, 2013; Edmondson, 2012, 2011; Rybowiak et al., 1999).

Limitations and Future Research

This study is subject to several limitations and leads to questions for future research. First, this study was conducted with junior auditors, a crucial group because of their role in the hierarchical audit process. By including a complete cohort we limited self-selection effects and noise in the data, but

the current sample does not allow us to take into account effects of task and error experience. For future research, it would therefore be interesting to observe how help-seeking behavior changes after experiencing errors of different magnitudes. For example we find negative correlations between making small errors yourself and in one's team and seeking help from colleagues of a higher hierarchical level ($r = -0.258$, $p < 0.01$ and $r = -0.326$, $p < 0.001$), as well as between experiencing material errors and the learning value of help received ($r = -0.163$, $p < 0.05$). Therefore, including an interaction between error magnitude and perceptions of the firm's error climate could provide further evidence for the influence of climate on learning behavior. Second, by using a survey approach, we include auditors' actual experiences with errors, learning from error culture and help-seeking into account. While we cannot make causal claims based on this design, we made this choice because we do not assume that junior auditors have already experienced both supportive and unsupportive climates as well as different kinds of social networks at work, so that experimental manipulations would not activate knowledge based on personal experience, limiting validity of possible findings (Berry et al., 2012; Tulving & Schacter, 1990). Third, we did not include a performance measure, which would be a relevant next step in understanding the long-term effects of learning from errors on performance, e.g. through a longitudinal design.

Implications for Practice

The findings of this study have several implications for error management in audit firms. Edmondson (2012) emphasizes the crucial role of managers in shaping a firm's learning climate. By admitting own errors, offering support and resources for resolving and learning from errors, and by acknowledging the reporting and knowledge gained from learning from errors, supervisors can lead by example and set the tone for a supportive learning climate (Edmondson, 2012; Putz et al., 2012). Another implication regards how auditors utilize their help networks within the firm. To encourage seeking help of high learning value, it is important to build networks in which trust can develop, e.g. through longer / recurring assignments under a supportive leader. In addition, audit firms can provide opportunities for members to meet each other and learn about each other's expertise beyond team boundaries, in a supportive climate. Therefore, deliberately designing the firm environment to facilitate the seeking of high-value help after experiencing errors at the junior level can be a powerful tool for audit firms to improve audit quality, in the short- as well as the long-term.

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CHAPTER 5

MINIMIZING PROFESSIONALS' OVERCONFIDENCE BY MAXIMIZING LEARNING: FEEDBACK, CHECKLISTS AND REFLECTION

"Ignorance more frequently begets confidence than does knowledge"
- Charles Darwin

ABSTRACT

Professionals making judgments under uncertainty are often subject to overconfidence, which limits their judgment accuracy and ability to improve. Professions acknowledge that reducing professionals' overconfidence is a crucial step towards improving judgment accuracy. However, this requires effective interventions to do so. Using a representative task and a sample of professionals in the field of auditing, we explore the effects of providing performance feedback and a checklist on overconfidence. We found that providing a checklist along with performance feedback actually increased overconfidence. This effect was reversed however when participants were guided to reflect on the feedback and checklist items. These findings address calls from research to develop interventions for decreasing overconfidence, and provide a mechanism for increasing judgment accuracy that can be integrated into accounting firms' existing judgment processes.

This chapter is based on Grohnert, T., Meuwissen, R.H.G., & Gijssels, W.H. (under review). Minimizing Professionals' Overconfidence by Maximizing Learning: Feedback, Checklists and Reflection. *Organizational Behavior and Human Decision Processes*.

5.1 | INTRODUCTION

Patients expect doctors to make accurate diagnoses, financial institutions want their investors to choose the best opportunity, and society entrusts auditors to truthfully check their clients' financial statements. Research on professionals' judgments has consistently shown that making accurate judgments requires specific knowledge of the task, as well as the ability to monitor one's judgments' accuracy (Dunning, Johnson, Ehrlinger, & Kruger, 2003; Kruger & Dunning, 1999; Schön, 1983; Seibert, 1999). However, within different domains and different research traditions it has been consistently shown that perceived judgment accuracy does not equal actual judgment accuracy: on average they correlate by only 0.290 (for a review, see Zell & Krizan, 2014). In fact, research points out that among professionals, confidence is a poor predictor for judgment accuracy; even more, they tend to overestimate the accuracy of their judgments (Hardies, Breesch, & Branson, 2012; Moore & Healy, 2008; Zell & Krizan, 2014).

Expressing high confidence in an accurate judgment demonstrates professional's awareness of their performance, and enables them to take adequate action. By contrast, professionals who express the same high confidence when their judgment is inaccurate can be identified as overconfident (Dunning et al., 2003; Pillai & Goldsmith, 2006; Ryvkin, Krajč, & Ortmann, 2012). Several studies have compared overconfident professionals with those whose confidence matches judgment accuracy, finding that overconfidence relates negatively to both judgment accuracy as well as the ability to improve one's judgments (Dunning, Heath, & Suls, 2004; Ehrlinger, Johnson, Banner, Dunning, & Kruger, 2008; Zell & Krizan, 2014). Not surprisingly, substantial research efforts have been made to develop interventions improving judgment accuracy through decreasing overconfidence (Dunning et al., 2003; Ryvkin et al., 2012; Zell & Krizan, 2014).

Designing an effective intervention for decreasing overconfidence requires an understanding of the antecedents of overconfidence. Existing research on overconfidence has established that especially individuals with little knowledge or skill tend to overestimate their judgment accuracy (Dunning et al., 2003; Ehrlinger et al., 2008; Kruger & Dunning, 1999; Ryvkin et al., 2012). As Charles Darwin already observed in 1871 in his famous "The Descent of Man" (1871, p. 3), "ignorance more frequently begets confidence than does knowledge". This quote illustrates that monitoring one's judgment accuracy relies on the self-insight of one's knowledge. A similar conclusion was drawn by Ehrlinger et al. (2008) when demonstrating that overconfidence is not so much the result of low motivation or accountability,

but rather the consequence of a lack of knowledge. This lack of knowledge explained both judgment inaccuracy as well as a lack of improvement. Based on these findings they suggest that "one means of improving metacognitive ability - and this self-insight - is to improve one's level of skill. [...] We might than (sic) encourage greater self-insight by encouraging learning" (Ehrlinger et al., 2008, p.122). They concluded that it is essential to investigate how this self-insight can be encouraged through facilitation of learning. Learning is described by Eraut (2000, p. 114) as "the process whereby knowledge is acquired. It also occurs when existing knowledge is used in a new context or in new combinations". The present study examines how an intervention to stimulate learning from an inaccurate judgment can (1) decrease overconfidence and (2) improve judgment accuracy.

However, examples from practice show that opportunities for learning from poor judgments are often limited, because of time pressure, uncertainty of outcomes, or competition between professionals and organizations (e.g. Bauer & Mulder, 2013; Frese & Keith, 2015). Therefore, organizations have developed several procedures to support professionals' judgment processes. One of the best-known examples consists of the use of checklists in healthcare settings, aviation and auditing. Checklists are designed to decrease uncertainty, to support improvement of judgments and to ensure compliance with existing standards (Boritz & Timoshenko, 2014; Rose, McKay, Norman, & Rose, 2012). However, research on the effectiveness of checklists for enabling judgment accuracy cast significant doubt on whether the tool is actually facilitating the desired goals. Often, checklist-based judgments were found to be inferior to unaided judgments (for a comprehensive review, see Boritz & Timoshenko, 2014). Overall, these findings show that providing professionals with a checklist may be time-efficient in its use, but not necessarily effective in bringing about accurate judgments or an improvement of judgment accuracy. Given that evidence on the relationship between using a checklist and not just judgment accuracy, but overconfidence, seems to be scarce, this study will explicitly focus on the impact of using checklists on professionals' overconfidence.

Given Ehrlinger et al.'s (2008) findings, this study examines whether facilitating learning as part of using a checklist can reduce professionals' overconfidence. Professionals need to process information gained from the inaccurate judgment and any other support provided (such as a checklist) in order to gain knowledge for subsequent improvement. A mechanism reliably linked to creating knowledge from experiences and new information, has been introduced by Schön (1983): reflection, described as an iterative process of knowledge development as a reaction to new experience and

information. More recently, Anseel, Lievens and Schollaert (2009, p.23) defined reflection as "a cognitive process in which the person attempts to increase his or her awareness of personal experiences and therefore his or her ability to learn from them". Studies in university classrooms, aviation settings and in business simulations have indeed shown that facilitating reflection resulted in improved judgment accuracy (Anseel et al., 2009; Duijnhouwer, Prins, & Stokking, 2012; Gabelica, van den Bossche, Maeyer, Segers, & Gijssels, 2014). Adding to these findings, the present study investigates the influence of reflection on judgment accuracy as well as on overconfidence. We hypothesize that integrating reflection with the use of checklists enables professionals to improve judgment accuracy as well as to decrease their overconfidence.

To investigate this research question, we selected the domain of auditing as a suitable setting, first because of the domain's characteristics, and second due to audit firms' urgency to improve judgment accuracy. Regarding domain characteristics, several studies have found that overconfidence is especially prevalent in complex and unpredictable domains in which individual's performance is difficult to gauge (Ehrlinger et al., 2008; Zell & Krizan, 2014). Auditing as a domain is subject to exactly these characteristics: judgments are made with imperfect, yet complex, information, and judgment accuracy cannot be immediately determined (e.g. Abdolmohammadi, 1999; Shanteau, 1992; Libby & Luft, 1993; Owghoso, Messier, & Lynch, 2002). At the same time this profession relies fundamentally on individuals' ability to make accurate and well-founded judgments (Trotman, Tan, & Ang, 2011). Moreover, studies in auditing have demonstrated that overconfidence is associated with several negative outcomes. Overconfidence may result in low judgment accuracy even when complying with established procedures, collecting less evidence before making a judgment, paying less attention to disconfirming evidence, and responding less to feedback and errors (Messier, Owghoso, & Rakovski, 2008; Owghoso & Weickgenannt, 2009; Pincus, 1991). These outcomes of overconfidence link to the second reason for choosing auditing as a context: the field's urgency to improve judgment accuracy. Audit firms have a vested interest in decreasing overconfidence because in their recent review of close to 1000 audits performed by the largest firms in North America and Europe, the International Forum of Independent Audit Regulators (IFIAR, 2015) identified that auditors often do not engage in necessary behaviors to ensure judgment accuracy, such as collecting too little evidence or overlooking errors. IFIAR's report has made public the shortcomings of audits and strongly urges firms to investigate the root causes of poor judgments. Therefore, the present study examined interventions for decreasing overconfidence, and we aim to develop a better understanding

of the underlying mechanisms for increasing judgment accuracy. By doing so our findings can be integrated into accounting firms' existing judgment processes, and may add to reduction of overconfidence in other professional domains.

5.2 | THEORETICAL FRAMEWORK

The Negative Influence of Overconfidence on Professional Judgments

Across different research traditions and domains, overconfidence is often described within the calibration framework. Calibration is defined as "how well a judge's confidence relates to the accuracy of [...] a quantitative estimate" (Tsai, Klayman, & Hastie, 2008, p.97) and often represented in a 2 × 2 matrix as illustrated in figure 5.1 (Einhorn & Hogarth, 1978; Pillai & Goldsmith, 2006). It specifies four categories of calibration. Well-calibrated individuals report confidence in line with the accuracy of their judgments (high with accurate, and low with inaccurate judgments). On the other hand, miscalibrated individuals are either underconfident (high accuracy paired with low confidence) or overconfident (low accuracy paired with high confidence). A review by Zell and Krizan (2014) has shown that miscalibration is a consistent phenomenon observed across a variety of studies, samples and methodologies used.

		Judgment Accuracy	
		Inaccurate	Accurate
Relevant Information	No	45.3% (N=24)	11.3% (N=6)
	Yes	13.2% (N=7)	30.2% (N=16)

Figure 5.1. Calibration of all participants at the end of the baseline phase

Significant differences exist between well-calibrated and overconfident individuals regarding their judgment accuracy. First, research in finance and investment has shown that overconfident performers tend to make less accurate judgments (e.g. Biais, Hilton, Mazurier, & Pouget, 2005; Eichholtz & Yönder, 2015; Zacharakis & Shepherd, 2001). Second, in cognitive psychology research, overconfidence has also been linked to an apparent inability to improve inaccurate judgments in the absence of support (Ehrlinger et al., 2008; Ryvkin et al., 2012; Tsai et al., 2008). These results show that organizations have two performance-related reasons to decrease overconfidence: higher judgment accuracy in the short term, as well as improvements in judgment accuracy in the medium term.

Sources of Overconfidence

Next to the observation that overconfidence occurs especially in complex and unpredictable domains (Zell & Krizan, 2014), research on antecedents of overconfidence has focused on two different explanations: motivational and cognitive (Ehrlinger et al., 2008). The motivational perspective holds that individuals are able to accurately assess their own performance, but lack the incentives to do so, e.g. because of self-serving biases (e.g. Baumeister & Newman, 1994). This perspective thus represents a compliance view on overconfidence: individuals need to be properly motivated to accurately monitor their own performance by following established procedures. In the motivational perspective, decreasing overconfidence implies creating the right incentives for individuals to improve their accuracy. Studies especially in economics have shown that providing (monetary) incentives can motivate individuals to try harder and to focus less on self-presentation (e.g. Camerer & Hogarth, 1999). In their systematic investigation of the relationship between incentives and changes in calibration however, Ehrlinger et al (2008) show that neither a monetary incentive nor an intervention to increase accountability affected calibration in overconfident performers. Empirical support for overconfidence as a motivational problem is therefore very limited, even if the view is taken in practice (as discussed below).

By contrast, the cognitive explanation proposes that overconfidence occurs due to a lack of knowledge that prevents individuals from understanding the sources of performance and therefore limits their ability to judge and improve their own performance (Ehrlinger et al., 2008). Evidence for this view was provided in Zell and Krizan's (2014) meta-analysis, finding a slightly higher correlation between performance and confidence in familiar ($r = 0.32$) than in unfamiliar tasks ($r = 0.26$). Moreover, Kruger and Dunning

(1999), Ehrlinger et al. (2008) and Dunning et al. (2004) demonstrate that overconfidence is more prevalent in unskilled performers. With experiments across a variety of tasks, samples and settings, they demonstrate that the absence of skill and knowledge is a key contributor to overconfidence. Ehrlinger et al. (2008) conclude based on several experiments and a meta-analysis that overconfident performers did not display sufficient insight into the reasons for their inaccurate judgments. This prevented them from recognizing the need to improve or understanding how to improve. The cognitive explanation thus represents a learning view on overconfidence; understanding factors that contributed to an inaccurate judgment creates new knowledge. This new knowledge then contributes to future judgment accuracy as well as to a more accurate perception of one's judgment accuracy. It implies that to improve judgment accuracy and to decrease overconfidence, organizations need to actively support learning from inaccurate judgments.

Addressing overconfidence as a compliance problem: feedback and checklists

In organizational practice, despite empirical evidence discussed above, it appears that overconfidence is often treated as a compliance problem. In treating overconfidence as a lack of incentives for professionals to accurately monitor their own performance, this approach has led organizations to provide support that would ensure compliance with established procedures. In a first step, professionals are made aware of their inaccurate judgments (Ryvkin et al., 2012; Stone & Opel, 2000). In a second step, organizations provide information on expected performance standards and procedures to be followed to reach them; often in the form of checklists (Boritz & Timoshenko, 2014; Rose et al., 2012). Both support forms provide information to the individual, but do not support the development of knowledge from the inaccurate judgment. Information about one's judgment accuracy is often given in the form of performance feedback, defined as "providing information about the accuracy of one's judgments in general, for example that the person was overconfident" (Stone & Opel, 2000, p.2000). Stone and Opel (2000) as well as Ryvkin et al. (2012) find that performance feedback helps overconfident performers to improve judgment accuracy. On the other hand, Hacker et al. (2000) as well as Kruger and Dunning (1999) find that overconfidence is not significantly improved by feedback on judgment accuracy. One explanation for the absence of this effect is that feedback may not be processed sufficiently to result in the necessary knowledge development (Ehrlinger et al., 2008; Kruger & Dunning, 1999). We therefore expect that providing performance

feedback without support for processing and learning is not sufficient in improving calibration in overconfident professionals, leading to the following hypotheses:

- H1a: Receiving performance feedback will be associated with stable judgment accuracy.
- H1b: Receiving performance feedback will be associated with stable confidence.
- H1c: Receiving performance feedback will be associated with stable calibration.

Next to providing performance feedback, checklists are a frequently used tool to support the making of professional judgments, illustrated here by literature from the audit domain (Boritz & Timoshenko, 2014). Audit checklists are designed to "increase accuracy, expedite the decision-making process, increase decision quality, decrease the effort required for effective performance [and] free cognitive resources" (Rose et al., 2012, p.10-11). Contrarily, research on the relationship between using checklists and judgment accuracy has shown that judgments made with the help of a checklist are often less accurate than unaided judgments (Ashton, 1992; Bell & Carcello, 2000; Boritz & Timoshenko, 2014; Eining, Jones, & Loebbecke, 1997). In response to these counterintuitive findings, Wheeler and Arunachalam (2008) as well as Boritz and Timoshenko (2014) argue that the information in a checklist may narrow the user's attention, preventing meaningful processing of the information conveyed. Their research showed that auditors employing a checklist fall prey to the confirmation bias more than auditors making an unaided judgment.

However, neither of these studies has considered the relationship between professionals' confidence and the use of checklists. In developing our hypothesis, we rely on studies that investigate the effect of providing additional information, but no support in processing, on calibration. Both Oskamp (1965) and Tsai et al. (2008) find that providing additional information actually worsened calibration: judges did not improve their judgment accuracy, but instead reported significantly increased confidence. Tsai et al. (2008) argue that additional information may provide a false sense of coherence and confirmation, boosting confidence. This effect was indeed found by Wheeler and Arunachalam (2008) in the auditing domain: auditors who used checklists were significantly more subject to confirmation bias than auditors not using the checklist. Based on these findings, in this study we explicitly focus on the relationship between using a checklist after

receiving negative performance feedback and calibration, leading to the following hypotheses:

- H2a: Following a checklist after receiving performance feedback will be associated with stable judgment accuracy.
- H2b: Following a checklist after receiving performance feedback will be associated with increased confidence.
- H2c: Following a checklist after receiving performance feedback will be associated with decreased calibration.

Addressing Overconfidence as a Learning Problem: Reflection

Treating overconfidence as a learning problem, rather than a compliance problem, implies that support provided to professionals needs to facilitate the development of new knowledge in the face of inaccurate judgments. Under time pressure and uncertainty however, receiving support beyond performance feedback and established procedures is unlikely (Bonner & Walker, 1994; Rose et al., 2012). To ensure that professionals are able to learn from making an inaccurate judgment, organizations need to actively foster the processing of all information received. Reflection as defined by Schön (1983) and Anseel, Lievens and Schollaert (2009) has previously been shown to lead indeed to the development of knowledge and competences, successful learning from errors, and improved performance outcomes in several contexts (Ellis & Davidi, 2005; Gartmeier, Kipfmüller, Gruber, & Heid, 2008; Harteis, Bauer, & Haltia, 2007; Strasser & Gruber, 2005). To date however, evidence on the relationship between reflection and calibration is sparse; we therefore study how reflection interacts with providing feedback and using checklists to decrease overconfidence.

Based on results from studies on the interaction effect between receiving feedback and being instructed to reflect, we expect reflection to positively lever the effect of feedback received (Anseel et al., 2009; Duijnhouwer et al., 2012; Gabelica et al., 2014). A positive interaction between reflection and feedback was shown in an office-based task (Anseel et al., 2009), in a university writing course (Duijnhouwer et al., 2012) as well as in an aviation task (Gabelica et al., 2014). Anseel et al. (2009) explain this positive interaction in three ways; reflecting may lead professionals to better process the feedback received, may direct the path to improvement better than either element alone, and finally, the combination of feedback and reflection may provide professionals with assurance that they will be able to improve.

Complementarily, a separate set of studies in auditing has established that encouraging reflection when using a checklist improves judgment accuracy (e.g. Ashton, 1992; Wheeler & Arunachalam, 2008). A 'justification requirement' asks an auditor to provide a (written) reasoning for their judgment, in which elements of the checklist are critically evaluated and related. The justification requirement therefore represents a means of encouraging reflection (along with accountability, as it is used in audit research). Ashton (1992) found that using a justification requirement along with another judgment aid leads to significant increases in auditors' judgment accuracy. More recently, Wheeler and Arunachalam (2008) found that auditors' judgments are less subject to the confirmation bias. Similar findings with respect to auditors' judgment accuracy were obtained by e.g. Johnson & Kaplan (1991), Kennedy (1993), and Hornick and Ruf (1997). Reflection may thus reverse the potentially negative effects of providing additional information after an inaccurate judgment. If indeed reflection is an effective tool to improve calibration, this provides organizations with a powerful lever to existing judgment processes including performance feedback and the use of checklists, leading to the following hypotheses:

- H3a: Encouraging reflection when using a checklist is associated with an increase in judgment accuracy.
- H3b: Encouraging reflection when using a checklist is associated with an increase in confidence.
- H3c: Encouraging reflection when using a checklist is associated with an increase in calibration.

Improving Judgment Accuracy in Overconfident vs. Well-Calibrated Professionals

In a final step, we are investigating whether reflection benefits overconfident performers more than well-calibrated professionals in improving judgment accuracy (e.g. Ehrlinger et al., 2008; Rvkin et al., 2012), we are investigating whether overconfident auditors actually require different support from well-calibrated (low) performers. In developing our hypothesis, we rely on three key findings discussed above. First, overconfidence is a phenomenon consistently observed across several domains and tasks (e.g. Zell & Krizan, 2014). Second, confidence remains stable or even increases when providing additional information (e.g. Oskamp, 1965; Tsai et al., 2008). Third, the interaction of feedback and reflection has been shown to positively affect performance (e.g. Anseel et al., 2009; Gabelica et al.,

2014). We therefore expect well-calibrated professionals to improve their judgment accuracy even in the absence of reflection. By contrast, we expect overconfident professionals to benefit significantly from reflection to increase judgment accuracy and to increase calibration. Considering the different effects of reflection on two groups of professionals with equally inaccurate judgments but differing confidence allows the design of targeted interventions to improve judgment accuracy based on existing calibration. This knowledge enables organizations to effectively as well as efficiently support professionals in learning from inaccurate judgments, leading to our final hypothesis:

H4a: Overconfident individuals will not improve their calibration without reflection.

H4b: Well-calibrated individuals will improve their calibration without reflection.

In addition, we expect the magnitude of improvement in judgment accuracy to depend on professionals' existing knowledge (e.g. Kruger and Dunning, 1999; Ehrlinger et al., 2008). We therefore include task experience as well as experience with audit errors as covariates to investigate the effect of existing experience on calibration.

5.3 | METHODS

Setting

This study was conducted in an audit setting with experienced young professionals to take advantage of participant's existing relevant professional knowledge and task experience (Moore & Healy, 2008). Auditing was chosen because accurate judgments and corresponding actions are central to audit quality and firm performance (Francis, 2011), and because judgments are made under considerable complexity and unpredictability (Libby & Luft, 1993; Owchoso, Messier, & Lynch, 2002; Shanteau, 1992). Within audit firms, the judgment process is organized across hierarchical levels. Junior auditors collect relevant evidence and form a first judgment, which is then checked by their manager (Gibbins & Trotman, 2002). The manager is also in charge of supporting junior auditors' learning (Westermann, Earley & Bedard, 2015) and therefore the most likely source of feedback and other support, which is reflected in this experiment.

EXPERIMENTAL DESIGN, PROCEDURE AND SAMPLE

Each participant completed an online case-based experiment, taking ca. 45 minutes as part of a training session required for professional certification in the presence of at least one researcher. The case that forms the basis for the experiment was developed in collaboration with an audit firm using actual client data. The case requires participants to perform an audit of a hypothetical client's accounts receivable. This task was chosen for several reasons. Analyses of audit failure often refer to problems with confirming accounts receivable (Beasley et al., 2001; Payne & Ramsay, 2005). Past research has shown that fraud is frequently committed by introducing fictitious accounts receivable (Knapp & Knapp, 2001).

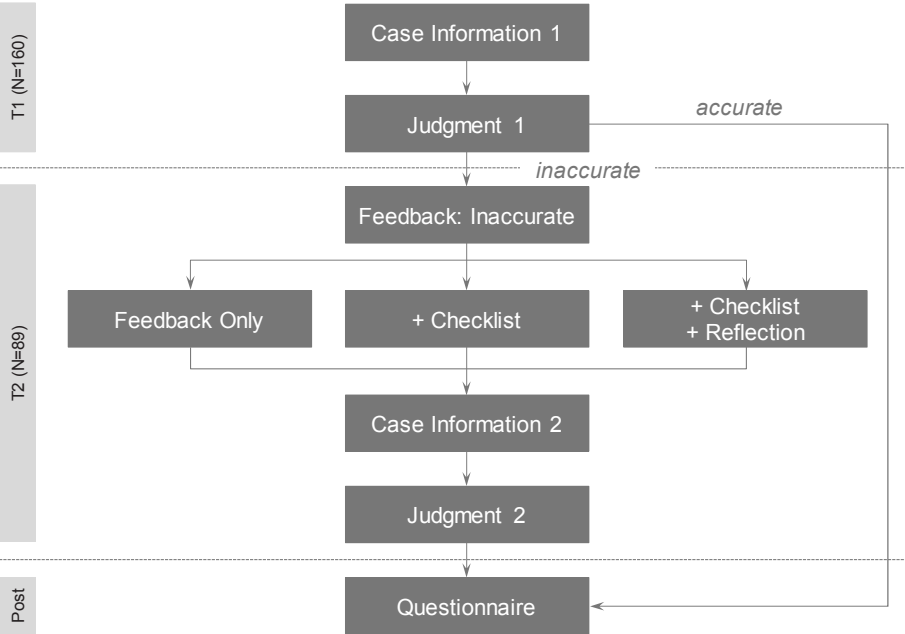


Figure 5.2. Experimental design across the two phases

Phase 1 - Baseline Calibration. The experiment consisted of two phases (see figure 5.2). In phase 1, referred to as the 'baseline' phase, we establish participants' judgment accuracy, confidence and calibration without any manipulations. After receiving information about a hypothetical client, participants were asked to judge how likely each of three debtors are to settle their outstanding positions, and to indicate the confidence in their judgment. No manipulations were conducted in the first phase of the experiment so as to create the same conditions for all participants. As a result, all 160 participants' calibration could be determined according to the

calibration matrix presented above. Those auditors who made an inaccurate judgment (see operationalization of judgment accuracy below) at the end of the baseline phase, and either displayed below-or above-chance levels of confidence, advanced to the second phase of the experiment.

Phase 2 - Experimental Manipulation. In the second phase of the experiment, labeled the 'manipulation' phase, we provide those participants who made an inaccurate judgment in the baseline phase with different support for improving their calibration. At the start of the manipulation phase participants could be grouped according to their calibration; those who made an inaccurate judgment paired with above-chance confidence were labeled 'overconfident', while those who made an inaccurate judgment but displayed confidence at or below chance level were labeled 'well-calibrated'. This distinction was unknown to the participants. The 89 participants who advanced to the second phase of the experiment had an average of 12.9 months of audit-specific work experience (ranging from 1 to 36 months), and 31% of participants are female. These participants were then randomly assigned to one of three experimental conditions, the only manipulation included in this experiment. The first experimental condition is labeled 'feedback only', the second is labeled 'feedback + checklist', and the third is labeled 'feedback + checklist + reflection'. The support conditions were designed in line with Wheeler and Arunachalam's (2008) principle of presenting the same information in different formats to test differences in processing. In the 'feedback + checklist' condition, participants received a list of steps to be taken, clearly labeling the kind of information participants need to consult to improve their judgment. In the 'feedback + checklist + reflection' condition, questions were added to each item on the checklist to stimulate reflection. The questions were developed in collaboration with auditors possessing significant experience in audit practice as well as in audit education. The support provided to the participants in each condition is detailed in table 5.1. Participants could then reinvestigate the case information they were familiar with from the baseline phase of the experiment and could reformulate their judgment of the three debtors. Participants also indicated the confidence in their performance a second time. We can therefore track changes in both judgment accuracy and confidence between the two phases of the experiment, taking into account participants' calibration at the end of the baseline phase as well as their experimental condition in the manipulation phase, resulting in a 2×3 repeated-measures design.

Table 5.1. Information provided to participants in the three experimental conditions

Condition	Information provided to participants
Performance Feedback	Your manager performs a review of your audit activities and finds that you made a mistake when judging your client's accounts receivable. Your manager is giving you advice on how to improve our judgment. You can access it in the box 'Manager Advice' below.
Feedback Only	Your manager calls you and asks you to check the companies with outstanding positions again.
Feedback + Checklist	<p>Together with you, he runs through the client's file once more and gives you the following instructions:</p> <ol style="list-style-type: none"> 1) Examine and evaluate the client's analysis of the companies' likelihood of payment. 2) Examine the financial information of each company with debt outstanding. 3) Loop up additional information about companies with outstanding positions. <p>Based on this information, you judge whether Seret Sport's allowance for bad debt is accurate.</p>
Feedback + Checklist + Reflection	<p>Together with you, he runs through the client's file once more and gives you the following instructions:</p> <ol style="list-style-type: none"> 1) Examine and evaluate the client's analysis of the companies' likelihood of payment. Is each company's reply documented? Is the company response given by the correct person? 2) Examine the financial information of each company with debt outstanding. Is each company's solvency, profit level and cash flow in line with common levels? 3) Loop up additional information about companies with outstanding positions. Does the information in press statements or market sector reports confirm or contradict your current view of each company's likelihood of payment? <p>Based on this information, you judge whether Seret Sport's allowance for bad debt is accurate.</p>

Measures of Judgment Accuracy and Confidence

We operationalize *judgment accuracy*, the first dependent variable in this study using a relative approach, because absolute judgments are unrealistic in the audit context given high complexity and the absence of perfect predictability (Bédard, 1989). When presenting the case, participants were asked to judge how likely three different debtors were to settle their outstanding positions. Information that participants could, but were not required, to access in the experiment provided factual evidence for a high,

medium, and low likelihood of payment in the form of different cash flows. Case information thus indicated a payment likelihood of debtor $B > C > A$, which constitutes the criterion for determining judgment accuracy. Participants' order of percentage judgments of the three debtors is compared to the accurate order by calculating the differences in percentage judgments between each pair of debtors, a simplified approach based on studies using rank-order tasks (e.g. Bedard & Mock, 1990; Kruger & Dunning, 1999). The resulting measure ranges from -46.70% to +40% in the baseline phase and from -53.3% to +50% in the manipulation phase. Negative scores indicate that participants did perceive differences in payment likelihood, but in a different order (an inaccurate judgment); a score close to or at zero indicates that participants evaluated all three debtors equally (this absence of a judgment is also considered inaccurate); finally, a positive score indicates that participants judged the payment likelihoods differently and in the correct order (an accurate judgment). Judgment accuracy was measured at the end of both experimental phases to allow for a repeated-measures investigation.

In addition to indicating their judgments of debtor payment likelihood, both at the end of the baseline and manipulation phase of the experiment, participants indicated, in percent, how *confident* they felt in their judgments of the three debtors (in line with e.g. Dunning, 2011; Ryvkin, Krajč, & Ortmann, 2012). The resulting variable ranges from 0% to 100% in the baseline phase and from 10% to 100% in the manipulation phase, and constitutes the second dependent variable in this study. Based on participants' confidence in their judgment at the end of the baseline phase, we split the sample to group participants who indicated below-chance levels of confidence in their inaccurate judgment at the end of the first phase (labeled well-calibrated), and those who indicated at- or above-chance levels of confidence (labeled overconfident) in their incorrect judgment. This distinction allows us to compare whether overconfident performers are able to improve their judgment accuracy and calibration, using the well-calibrated group as a control.

Finally, *calibration* itself is operationalized as the difference between participants' judgment accuracy and the confidence expressed in this judgment, in line with e.g. Ehrlinger et al. (2008). Centering the confidence rating on 0% allows contrasting participants' judgment accuracy and confidence. This difference ranges from -66.70% to +53.30% in the baseline phase and from -83.30% to +50.03% in the manipulation phase. A negative difference means that confidence exceeds accuracy (indicating overconfidence), a score close to or at zero indicates good calibration (either high or low), and positive scores show that accuracy exceeds

confidence (indicating underconfidence). To improve their calibration, overconfident participants with negative scores should therefore increase their calibration score, and underconfident participants with positive scores should decrease their calibration score.

Amount of relevant task experience is included as a covariate in this study. After the completion of the case, participants indicated how many months they have been executing audit judgments themselves. We expect task experience to contribute positively to auditors' ability to improve their calibration (Ehrlinger et al., 2008).

Analysis

To test hypotheses 1-3, we use paired-sample t-tests to compare changes in judgment accuracy and confidence across the three experimental conditions and between the two calibration groups. Cohen's *d* is reported as an effect size. Hypothesis 4 is investigated using a two-way repeated-measures ANCOVA. This approach allows us to investigate interactions between the experimental conditions of feedback, checklists and reflection, and participants' prior calibration, taking into account the covariates. Partial eta square is reported as effect size measure.

5.4 | RESULTS

Descriptive Findings

In a first step, we investigated how many of the participants at the end of the baseline phase were well-calibrated, over- or underconfident. Figure 5.1 shows the distribution of participants across the four calibration categories. We find that 38.1% of participants were overconfident (having made an inaccurate judgment with high confidence), making up the largest of the four groups. By contrast, only 17.5% of participants acknowledged their inaccurate judgments through below-chance level confidence. Those participants in the overconfident and well-calibrated (low) categories advanced to the manipulation phase of the experiment and got the opportunity to improve their judgment accuracy, confidence and calibration. Table 5.2 shows how participants' calibration changed between the baseline and manipulation phases of the experiment. Of the well-calibrated participants, the majority remained well-calibrated (36%) and 29% became

underconfident. A further 32% became overconfident. Of the overconfident participants, 62% became well-calibrated (either high or low, with 28% and 34% respectively), and 35% remained overconfident. These flows are of course subject to the three experimental conditions, which are investigated in hypotheses 1 and 2.

Table 5.2. Transition between calibration categories from baseline to manipulation phase

	<i>Calibration after Manipulation Phase</i>			
	Calibrated (high) (N=11)	Under- confident (N=34)	Over- confident (N=10)	Calibrated (low) (N=34)
<i>Calibration after Baseline Phase</i>				
Overconfident (N=61)	28.0%	0.3%	35.0%	34.0%
Well-calibrated (low) (N=28)	0.4%	29.0%	32.0%	36.0%

Hypotheses 1-3: Changes in Calibration by conditions

In phase 1, we did not find significant differences in participants' judgment accuracy ($F = 0.395$, $p = 0.675$, $\omega^2 = -0.014$), confidence ($F = 0.386$, $p = 0.681$, $\omega^2 = -0.014$) or calibration ($F = 0.904$, $p = 0.409$, $\omega^2 = -0.002$) across the three experimental conditions (feedback only, feedback + checklist and feedback + checklist + reflection). Moreover, we also explored whether participants in the different support conditions spent meaningful time processing the support they received. We found that participants in the three conditions spent significantly different times accessing the support: $F(2,86) = 7.502$, $p = 0.001$. Participants in the feedback only condition spent the least time (and also had the least information to process) ($M = 0.258$ minutes, $SD = 0.294$). We did not find a significant difference in time used to process the checklist ($M = 0.732$ minutes, $SD = 0.744$) or the checklist with questions for reflection ($M = 0.928$ minutes, $SD = 0.867$). Integrating support for reflection with the existing checklist therefore did not require participants to spend significantly more time and therefore does not compromise the efficiency of the tool in this study.

In line with hypotheses 1-3, we investigated whether participants in the three conditions improved their calibration. Results of the paired-sample t-tests are reported in table 3 panels A, B and C, respectively, and differences between the conditions are illustrated in Figure 5.3. In line with our expectations, we find that participants in the 'feedback only' condition do not significantly improve their judgment accuracy, confidence or their calibration, lending support to hypothesis 1. Next, we find that in the 'feedback + checklist' condition, confidence in participants' judgment

significantly increased from the baseline to the manipulation phase ($t(30) = 2.639$, $p = 0.013$, Cohen's $d = 0.461$), a change that is not accompanied by an increase in judgment accuracy, but also not large enough to significantly decrease calibration ($M2-M1 = -4.541$, $t(30) = 0.828$, $p = 0.414$, Cohen's $d = 0.136$), lending support to hypothesis 2.

Finally, in line with our expectations, in the 'feedback + checklist + reflection' condition, participants increased their calibration to marginal significance, approaching zero ($M2-M1 = 9.460$, $t(23) = -1.884$, $p = 0.072$, Cohen's $d = 0.326$). This improvement in calibration is driven by a significant improvement in judgment accuracy ($M2-M1 = 11.412$, $t(25) = 2.621$, $p = 0.013$, Cohen's $d = 0.548$) accompanied by an insignificant and small increase in confidence. We therefore conclude that in line with our hypothesis 3, participants increased their calibration only in the 'feedback + checklist + reflection' conditions.

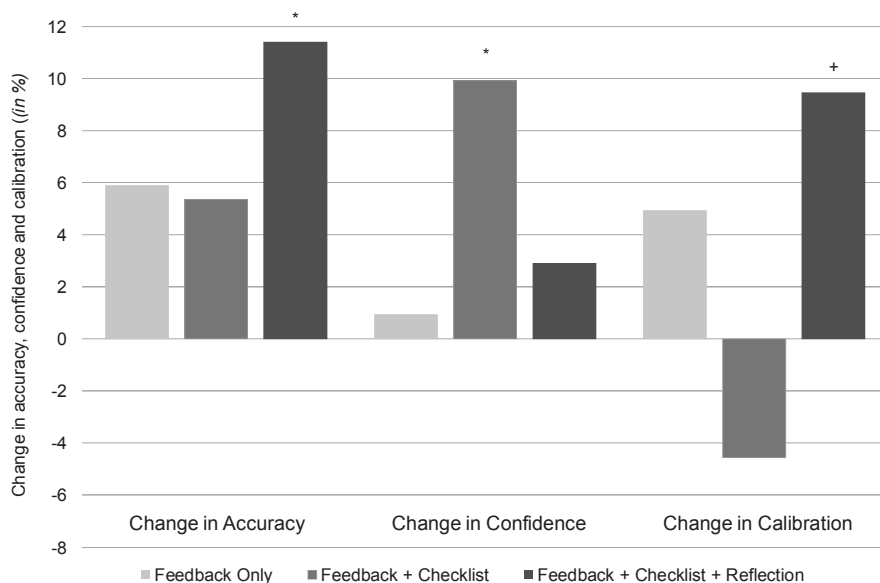


Figure 5.3. Change in Calibration measures (in %) between the two phases across the three experimental conditions

Table 5.3 Paired-Sample t-tests for changes in accuracy, confidence, and calibration between phases and across support conditions

	Baseline Phase		Experimental Phase		Difference	
	M1	SD	M2	SD	M ₂ -M ₁	t(df)
<i>Panel A. Change in accuracy, confidence and calibration in the feedback only condition</i>						
Change in Accuracy	-4.777	21.400	1.110	16.934	5.887	1.583(29)
Change in Confidence	64.833	17.212	65.778	19.396	0.945	0.518(29)
Change in Calibration	-19.610	26.676	-14.668	25.498	4.942	-1.141(29)
<i>Panel B. Change in accuracy, confidence and calibration in the feedback + checklist condition</i>						
Change in Accuracy	-0.649	16.042	4.709	22.022	5.358	1.190(32)
Change in Confidence	59.530	24.260	69.452	18.419	9.922	2.639(30)*
Change in Calibration	-9.898	26.523	-14.439	28.868	-4.541	0.828(30)
<i>Panel C. Change in accuracy, confidence and calibration in the feedback + checklist + reflection condition</i>						
Change in Accuracy	-2.304	17.689	9.108	23.491	11.412	2.621(25)*
Change in Confidence	61.264	23.300	64.167	19.142	2.903	0.800(23)
Change in Calibration	-12.368	28.590	-2.908	29.373	9.460	-1.884(23)*

Note: significance is indicated as ⁺p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001

Table 5.4. 2 × 3 repeated-measures ANCOVA for accuracy, confidence and calibration in the manipulation phase

	Type III Sum of Squares			df	Mean Square	F-value	p-value	Partial η^2
Panel A. Accuracy in Manipulation Phase								
Baseline Accuracy		9	1	903.948	4.091*	0.047	0.055	
Baseline Accuracy × Task Experience	418.605	1		418.605	1.539	0.219	0.020	
Baseline Accuracy × Conditions	194.728	2		97.364	0.441	0.645	0.012	
Baseline Accuracy × Prior Calibration	130.820	1		130.820	0.592	0.444	0.008	
Baseline Accuracy × Conditions × Prior Calibration	129.104	2		64.552	0.292	0.748	0.008	
Error	15467.705	70		220.967				
Panel B. Confidence in Manipulation Phase								
Baseline Confidence	193.839	1		193.839	1.537	0.219	0.023	
Baseline Confidence × Task Experience	697.682	1		697.682	5.913*	0.017	0.075	
Baseline Confidence × Conditions	1215.268	2		607.634	4.818*	0.011	0.127	
Baseline Confidence × Prior Calibration	1276.368	1		1276.368	10.121**	0.002	0.133	
Baseline Confidence × Conditions × Prior Calibration	786.327	2		393.163	3.118*	0.051	0.086	
Error	8323.182	66		126.109				
Panel C. Calibration in Manipulation Phase								
Baseline Calibration	295.864	1		295.864	0.875	0.353	0.012	
Baseline Calibration × Task Experience	42.158	1		42.158	0.125	0.725	0.002	
Baseline Calibration × Conditions	2168.690	2		1084.345	3.209+	0.046	0.081	
Baseline Calibration × Prior Calibration	849.515	1		849.515	2.514	0.117	0.033	
Baseline Calibration × Conditions × Prior Calibration	1903.937	2		951.969	2.817*	0.066	0.072	
Error	24670.707	73		337.955				

Note: significance is indicated as ⁺ p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001

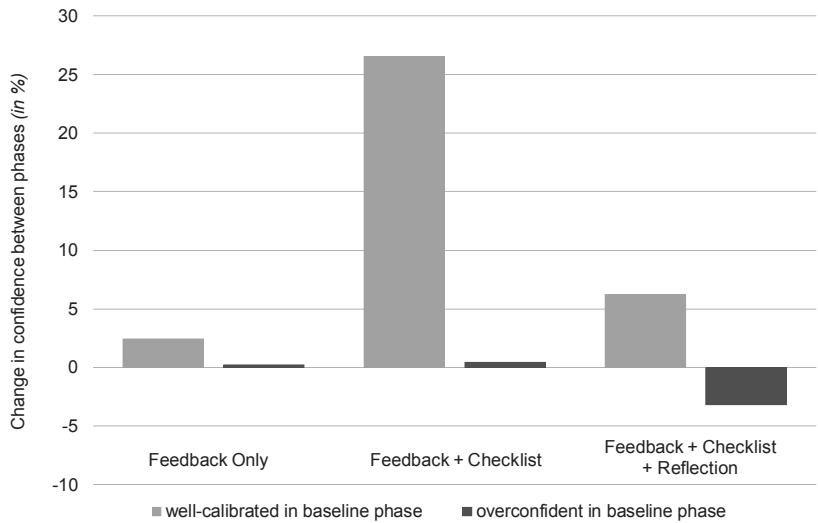


Figure 5.5 Panel A. Change in confidence by support conditions and overconfidence in the baseline phase

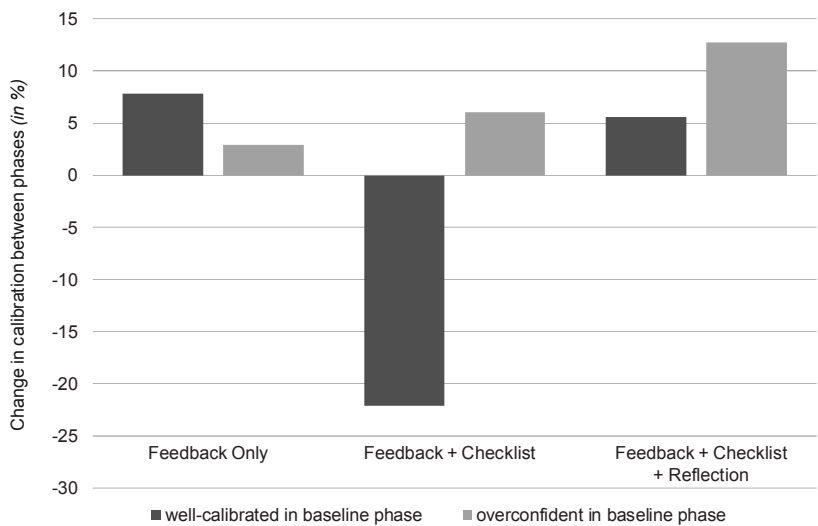


Figure 5.5 Panel B. Change in calibration by support conditions and overconfidence in the baseline phase

Hypothesis 4: Interactions between Overconfidence and Conditions

To investigate whether participants who were overconfident in the baseline phase benefited differently from the support conditions, we ran a two-way repeated-measures ANCOVA for each of the three dependent variables: judgment accuracy (table 5.4 panel A), confidence (table 5.4 panel B), and calibration (table 5.4 panel C). We find that the covariates of audit experience and error experience do not significantly explain changes in either judgment accuracy or calibration, but that audit experience interacts positively with confidence in the baseline phase to further increase confidence in the manipulation phase ($F = 5.913$, $p = 0.017$, partial $\eta^2 = 0.075$). Next, we find that well-calibrated auditors significantly increased their confidence between the baseline and the manipulation phase, while the confidence of overconfident auditors remained stable ($F = 10.121$, $p = 0.002$, partial $\eta^2 = 0.133$), visible in figure 5.5 panel A.

Overconfidence in the baseline phase did not impact changes in either judgment accuracy or calibration. By contrast, we find that the support conditions significantly moderate the relationship between confidence in the baseline and the manipulation phase ($F = 4.818$, $p = 0.011$, partial $\eta^2 = 0.127$), as well as the relationship between calibration in the two phases ($F = 3.209$, $p = 0.046$, partial $\eta^2 = 0.081$). Figure 5.5 panel B shows that calibration increased most in overconfident performers in the 'feedback + checklist + reflection' condition, and that the only group for whom calibration decreased were well-calibrated auditors in the 'feedback + checklist' condition. We also find two significant three-way interactions. Overconfidence in the baseline phase and the support conditions significantly interact with both confidence in phase 1 ($F = 3.118$, $p = 0.051$, partial $\eta^2 = 0.086$) and calibration in phase 1 ($F = 2.817$, $p = 0.066$, partial $\eta^2 = 0.072$). Therefore, fostering reflection along with providing feedback and a checklist matters when organizations want to improve calibration, and this support is critical for well-calibrated as well as overconfident professionals.

5.5 | DISCUSSION

The present study examined whether overconfident professionals can improve their judgment accuracy as well as their calibration by being supported in reflecting after making an inaccurate judgment. We researched this question in the audit setting, based on the domain's urgency to improve judgment accuracy (IFIAR, 2014), as well as its characteristics of complexity and unpredictability (Abdolmohammadi, 1999; Libby & Luft, 1993; Owthoso et al., 2002; Shanteau, 1992). We find that contrary to earlier findings by

e.g. Ehrlinger et al. (2008) and Kruger and Dunning (1999), overconfident auditors actually improved their judgment accuracy. At the same time, well-calibrated professionals became more confident. To interpret these findings, their contingency on the three experimental conditions needs to be considered. Contrary to popular practice, yet in line with our first hypothesis, professionals (whether overconfident or well-calibrated) neither improved their judgment accuracy nor their calibration, in line with findings by Hacker et al. (2000) and Kruger and Dunning (1999). Interestingly, we also confirmed our second hypothesis: providing a checklist after negative performance feedback did not lead professionals to improve their judgment accuracy, but instead actually decreased calibration. This finding is in line with Oskamp (1965) and Tsai et al. (2008) who both found that confidence increases when using more information for a judgment, while judgment accuracy does not improve.

As specified in hypothesis 3, we found that encouraging professionals to reflect after making an inaccurate judgment resulted in increased judgment accuracy, while confidence remained unchanged: calibration is (marginally) improved. In line with findings by Anseel et al. (2009), Duijnhouwer et al. (2012) and Gabelica et al. (2014), reflection positively interacts with the provision of feedback and in this study also with the use of checklists. In addition to these studies, we not only find an improvement in judgment accuracy, but also find a positive influence on calibration. This finding relates to existing findings on the design of checklists showing that e.g. a justification requirement significantly improves judgment accuracy when using a checklist (e.g. Ashton, 1992; Bell & Carcello, 2000; Boritz & Timoshenko, 2014). Our findings also correspond to the cognitive explanation of overconfidence, stating that a lack of knowledge lies at the heart of overconfident judgments (e.g. Ehrlinger et al., 2008; Kruger & Dunning, 1999; Ryvkin et al., 2012). Gaining insight into the reasons for one's inaccurate judgments through reflection indeed achieves the purpose that feedback and checklists alone cannot.

Finally, we find that both well-calibrated as well as overconfident auditors required support in order to improve their judgment accuracy, even though in different ways. Well-calibrated auditors responded to the use of checklists with a significantly increased confidence (while their judgment accuracy remained unchanged). In line with the argumentation by Tsai et al. (2008) we propose that this effect is due to a 'false sense of security'. Following the checklist may have reduced uncertainty and given participants the sense that they completed all necessary steps to form a good judgment without actually processing the information (Anseel et al., 2009; Duijnhouwer et al., 2012; Gabelica et al., 2014). These findings allow for the conclusion that

while checklists are efficient, they are not necessarily effective at supporting judgment accuracy; by contrast, in this study, they encouraged a worsening of calibration in well-calibrated auditors. An unexpected finding of this study is that overconfident performers' confidence remained stable across conditions, leading to the hypothesis that confidence may not be equally malleable in all professionals, a relevant starting point for future investigation. Based on these two findings, integrating reflection into the practice of providing performance feedback and checklists benefits organizations that seek to decrease overconfidence.

Limitations and Directions for Future Research

The findings in this study need to be interpreted with several limitations in mind. First, effects found are contingent on the design of the task and the support conditions (Wheeler & Arunachalam, 2008). We provided a realistic task in this study that builds on actual data provided by a Big4 audit firm. However, in practice, receiving negative performance feedback is likely to trigger a range of emotions and tangible consequences, potentially resulting in different behaviors from the ones observed in this study. Moreover, auditors may receive a variety of support in practice, including team-based judgments, decisions and consulting with experts as well as formal hierarchical reviews (Asare & Wright, 2003). This adds complexity to the issue as well as opportunities for providing the necessary support for auditors to improve their calibration. An additional limitation of this study lies in the focus on one profession as a setting. The current choice was made to reduce noise while ensuring enough variance through participation of auditors from several audit firms. Comparing the effects of reflection as an addition to checklist use e.g. in different professional domains such as medicine and aviation would add further knowledge needed to generalize our findings.

The present study provides a starting point for understanding how learning from poor judgments can improve calibration. In this frame, it would be interesting to track calibration longitudinally across poor judgments to investigate changes over time. Based on studies focusing on learning from error, we expect that the degree to which negative experiences such as poor judgments serve as effective triggers for learning will depend on the climate within an organization, shared understandings and values of whether failures such as inaccurate judgments are blameworthy or an opportunity for improvement and learning (Edmondson, 2002, 2011; Marsick & Watkins, 2003). These values are often visible in reactions by colleagues and leaders and as such impact how inaccurate judgments are

handled by the individual (e.g. Putz, Schilling & Kluge, 2012). Including these factors in future research will add a relevant layer to the understanding of determinants of overconfidence in the learning perspective.

Implications for Practice

Increasing judgment accuracy is a crucial challenge for audit firms, whose performance is heavily, and publicly, scrutinized (e.g. PCAOB, 2016; IFIAR, 2014). External oversight is requiring the firms to improve audit quality and consequently to investigate new ways to increase judgment accuracy, apart from designing incentive systems and adding regulation, which have not led to the desired improvements (AFM, 2014).

Looking at the challenge of improving judgment accuracy not as a motivational, but as a knowledge question allows us to derive practical implications that foster learning from inaccurate judgments and decreasing overconfidence. Our findings indicate that overconfidence and judgment accuracy can actively be managed by organizations. To increase judgment accuracy, organizations can leverage the effects of their current practices by integrating them with support for reflection. Crucially, in this study, participants did not spend significantly more time on processing the checklist compared to the checklist including guidance for reflection. This finding shows that integrating reflection with existing practices must not necessarily decrease efficiency, while clearly increasing effectiveness (as also demonstrated by Anseel et al., 2009; Gabelica et al., 2014).

Individuals in organizations, be it leaders or colleagues on equal terms, can actively take responsibility for fostering the development of insight. By seeking and providing feedback along with opportunities to reflect, they have the ability to continuously develop their own as well as their fellow colleagues' knowledge, and in turn, to improve calibration. Prior research on the role of leadership on learning and performance improvement has especially highlighted the power that leaders exercise through role-modeling desirable behavior (Edmondson, 2012; Bauer & Mulder, 2013; Zhao & Olivera, 2006). Demonstrating that everyone makes mistakes, that inaccurate judgments are not blameworthy but rather represent an opportunity for learning, by actively engaging in and encouraging feedback-seeking and reflection, leaders possess the tools to continuously improve both judgment accuracy and calibration (e.g. Edmondson, 2011, 2012).

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CONCLUSIONS

GENERAL DISCUSSION

VALORIZATION ADDENDUM

CHAPTER 6

GENERAL DISCUSSION AND CONCLUSIONS

"Das Tragische an jeder Erfahrung ist daß man sie erst macht,
nachdem man sie gebraucht hätte."
- Friedrich Nietzsche

6.1 | OVERVIEW OF FINDINGS

We all rely on professionals' ability to make well-supported and accurate judgments; we trust that doctors come to correct diagnoses, that pilots will bring us home safely, and that auditors only sign off on clients' financial statements when they can form a reliable opinion. However, a variety of studies have shown that professionals who are intelligent, motivated and highly educated do not consistently deliver the expected judgment quality (Gigerenzer & Gaissmaier, 2011b; Kahneman & Klein, 2009; Shanteau, 1992; Tversky & Kahneman, 1974). This dissertation has explored how professionals who act in limited-validity environments can be supported in forming high-quality judgments through workplace learning. This wider research question was investigated within the audit domain, because it is characterized by limited validity (Abdolmohammadi, 1999; Abdolmohammadi & Wright, 1987; Kahneman & Klein, 2009; Shanteau, 1992) and because the auditing profession is under significant pressure to improve audit quality (PCAOB, 2016; FRC, 2015; AFM, 2015). In the Netherlands, the Monitoring Committee Accountancy (2016) recently suggested that audit firms significantly invested in improving auditors' judgments through 'technocratic' measures, such as adapted procedures and incentive structures. In contrast, firms have not equally committed to 'adaptive' measures designed to change the culture within which judgments are made. Research presented in this dissertation is firmly rooted in the 'adaptive' approach by taking a workplace learning perspective towards enabling auditors to form high-quality judgments. Enabling auditors to learn from their experience provides a flexible, continuous means of improving auditors' judgment quality through the development of knowledge when and where needed. This interdisciplinary approach towards improving judgment quality is novel in the audit literature and has not received sufficient attention to date.

Figure 6.1 illustrates the baseline conceptual model investigated through four empirical studies in this dissertation. The first two studies explored the moderating influence of workplace learning on the relationship between auditors' amount of task experience and their judgment quality (study 1) and professional skepticism (study 2). A second set of studies has focused on auditors' error experience, studying it as a trigger of help-seeking (study 3), and how inaccurate judgments can be improved through stimulating learning (study 4). Results of these four studies have led to three key insights that are further discussed below:

- (1) Task experience is the necessary condition for forming high-quality judgments
- (2) Workplace learning is the sufficient condition for forming high-quality judgments
- (3) Auditors need to be actively enabled to learn at the workplace.

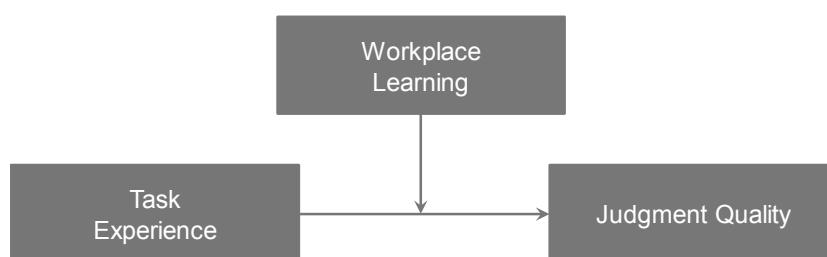


Figure 6.1. Baseline conceptual model of this dissertation

This last chapter discusses these three key insights by highlighting patterns across findings from all four studies, and describing the theoretical contribution of workplace learning to judgment and decision-making, expertise, and auditing research. Next, methodological challenges and lessons learned are outlined, along with an agenda for future research. Finally, implications for practice are developed, followed by a short conclusion.

6.2 | DISCUSSION OF RESULTS

The investigations presented in this dissertation started with the observation by the PCAOB (2016), the FRC (2015) and the AFM (2015) that auditors too often form judgments without collecting sufficient and relevant information. The first step in the investigation therefore was to establish whether in the current studies the same behavior could be observed. Figure

6.2 summarizes the relationship between auditors' task experience and (1) the amount of information they accessed in the case they were presented with (in percent), (2) their judgment accuracy (between 0 and 100%), and (3) the confidence participants expressed in their judgment accuracy (in percent). Including all participants of the first two studies ($N = 178$), three different curves emerge¹. First, auditors with more than 10 years of work experience collected increasingly less evidence before forming a judgment. Second, task experience and judgment accuracy were negatively, if only slightly related; more experienced auditors therefore did not make more accurate judgments, but instead, accuracy even slightly decreased. The third curve however clearly illustrates the issue faced by auditors with respect to judgment quality: instead of aligning with the curve of information accessed, the curve representing confidence actually increased for auditors with more than 15 years of experience. By itself, the shape of this curve is not problematic, after all, "experience tells you what to do; confidence allows you to do it" (Stan Smith). However, expressing higher confidence while collecting less information and not making more accurate judgments demonstrates it is indicative of overconfidence; more experienced auditors may be unaware of their own judgment quality. At the same time, these auditors are supervising the work of others, and are required to monitor their judgment quality as an integral part of each audit. Hence, within the sample examined in this dissertation, more task experience did not decrease the risk of an audit deficiency, but rather, was associated with a larger divide between information accessed to support a judgment, judgment accuracy, and confidence.

Relating this pattern to the broader literature of judgment and decision-making, the three curves represent the constraints placed on auditors by the limited validity of their professional environment (Croskerry, 2009; Einhorn, 1976; Kahneman & Klein, 2009; Shanteau, 1992). On the one hand, the decreasing amount of information accessed paired with increasing confidence points to inadequate pattern recognition (Croskerry, 2009). It appears that more experienced auditors are satisfied with less information to support a judgment. The observation that a significant proportion of auditors who did not access the relevant information still came to an accurate judgment nonetheless (21.9% of the sample) indicates that more experienced auditors rely on inferences fed by their past experience over actual evidence (Croskerry, 2009; Gigerenzer & Gaissmaier, 2011a). On the

¹ Interpreting these curves needs to account for two characteristics of the measures and sample. Accuracy and confidence represent performance on one task, and are therefore dependent on the current research design. Moreover, most auditors studied have between 0 and 21 years of experience. Confidence intervals for the three curves therefore become wider for auditors with more than 20 years of experience.

other hand, the increasing gap between judgment accuracy and confidence is indicative of miscalibration, specifically overconfidence (Lichtenstein & Fischhoff, 1977; Moore & Healy, 2008; Stone & Opel, 2000). This was also evidenced by the finding that all auditors who made an accurate judgment felt equally confident, irrespective of whether they had accessed relevant information or not. Crucially, the task used to measure these outcomes was chosen to be familiar to auditors across all hierarchy levels, either through execution or supervision. To summarize, auditors studied in this dissertation are indeed displaying behavior indicative of the constraints placed on them by their environment's limited validity, and that critically influence audit quality.

The four studies presented in this dissertation systematically address the question how judgment quality can be explained and improved through a workplace learning perspective. Across all studies, three patterns were discerned that are discussed below: (1) task experience's relationship with judgment quality is limited, (2) workplace learning contributes significantly to auditors' judgment quality, and (3) learning does not occur spontaneously; rather, it needs to be actively facilitated.



Figure 6.2. Relationships between task experience and (1) amount of information accessed, (2) judgment accuracy and (3) confidence in judgment accuracy across participants of part I (N=178).

Task Experience: A Necessary Condition for Judgment Quality

Results from both studies in the first part of this dissertation share a common finding: task experience plays a positive, yet limited role, even though they study judgment quality and auditors' skeptical attitude (Hurt, 2010), respectively. This common pattern derives from three key findings:

- (1) Regarding auditors' skeptical attitude, amount of task experience explains between 0% and 3.5% of variance. Task experience was only positively related to skeptical attitude for auditors in the first third of their career.
- (2) Task experience explains 6% of variance in auditors' judgment quality, a positive, yet relatively small effect.
- (3) Critical experience explained 10.6% more variance in judgment quality than years of task experience alone. Critical experience also positively and significantly moderated the relationship between amount of task experience and judgment quality.

These consistent findings, the limited role of amount of task experience, and the importance of critical experience, relate to existing theories and empirical evidence on judgment quality and professional skepticism. Kahneman and Klein (2009) and Shanteau (1992) state that within limited-validity domains, professionals' experience is not necessarily representative of the environments' structure, which means that more experience is not necessarily associated with more professional knowledge on the task provided, and in turn higher judgment quality. Within auditing, analogous reasoning is used in explaining the ability to detect fraud; those auditors who possess limited fraud experience are less able to detect fraud than auditors who have had to manage fraud in the past (e.g. Knapp & Knapp, 2001; Rose, 2007). The same reasoning applies to the relevance of critical experience in the first study. The informal learning model proposed by Marsick and Volpe (1999) proposes that learning is triggered by 'jolts' such as critical experience, because they inform professionals of their need to learn, in contrast to non-critical experience. This also proposes a framework for the results of study 2, showing that task experience only has a limited, if positive, relationship with auditors' skeptical attitude. In accordance with the highly inconclusive previous findings on the relationship between task experience and professionals skepticism (Hurt, Brown-Liburd, Earley, & Krishnamoorthy, 2013; Nelson, 2009; Payne & Ramsay, 2005; Shaub & Lawrence, 1996) results of this dissertation point to the possibility that task experience is also not a significant driver of skeptical attitude.

Consequently, within limited-validity environments, amount of task experience is an unreliable proxy for judgment quality. However, when task experience leads to the development of relevant knowledge, through critical experience, auditors are better able to make high-quality judgments.

Workplace Learning: A Sufficient Condition for Judgment Quality

Based on the conclusion that in limited validity environments, task experience and professional knowledge do not necessarily correlate, the next step in the investigation focused on mechanisms that foster the development of knowledge from experience. Workplace learning is operationalized in this dissertation as a circle of action and reflection that requires effortful processing of information, and that is integrated with daily, social work activities (Marsick & Volpe, 1999; Ericsson, Krampe, & Tesch-Römer, 1993; Salas & Rosen, 2010; Eraut, 2000; Marsick & Volpe, 1999). Both studies in part I investigate the same workplace learning mechanisms: learning climate (Marsick & Watkins, 2003), feedback (Ashford, 1986), and meta-cognition (Cartwright-Hatton & Wells, 1997). Despite investigating different outcomes, both studies reveal the same pattern with respect to the role the workplace learning mechanisms play. As shown in figure 6.3, the amount of variance explained by each mechanism is consistent across both studies:

- (1) Most variance is explained by the value and amount of feedback that auditors receive. This effect was strongest in study 2 for auditors in the middle of their career.
- (2) Meta-cognition explains the next highest amount of variance in both studies, with the highest percentage found again in study 2 for mid-career auditors.
- (3) Among the workplace learning variables, learning climate explained the least amount of variance in both studies, with slightly more variance explained in study 1.

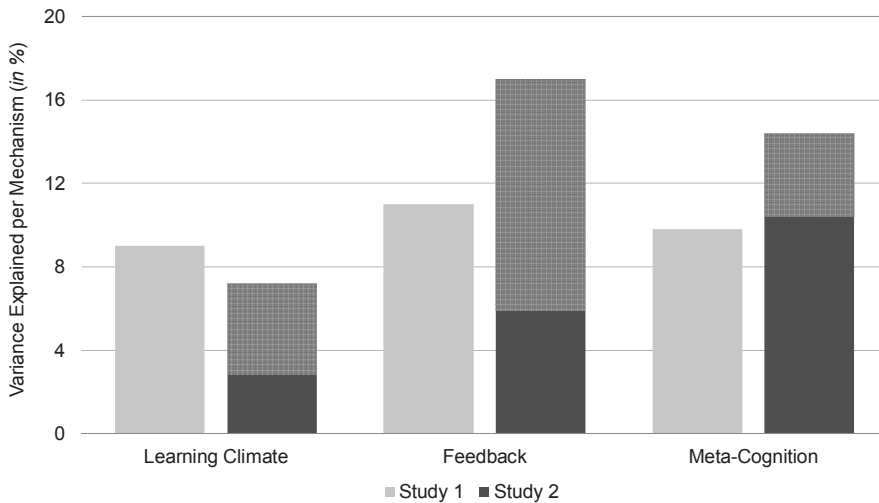


Figure 6.3. Comparison of variance explained by the three workplace learning mechanisms studied in part I. For study 2, the range of variance explained across subgroups is indicated by the two grey shades.

To summarize, the results of the first two studies provide clear evidence that workplace learning mechanisms play a significant role in explaining auditors' judgment quality and skeptical attitude, following workplace learning models by Eraut (2004), Marsick and Volpe (1999) and Tynjälä (2013). Moreover, the first two studies reveal that significantly more variance is explained by the workplace learning mechanisms than by amount of task experience. This proportion provides empirical evidence for Kahneman and Klein's (2009) assertion that professionals in limited-validity environments need to actively engage in learning from different experiences in order to develop the necessary knowledge for making high-quality judgments. Consequently, if task experience is the necessary condition for making high-quality judgments, workplace learning is the sufficient condition.

Workplace learning needs to be actively managed

Based on the findings in part I of this dissertation, a second set of studies were conducted in which amount of task experience is kept relatively stable, and instead, specific experiences are investigated as triggers of learning behavior (study 3) and of improvement in judgment accuracy and calibration (study 4). This second part of the dissertation reveals two specific patterns related to the findings in part I. First, experiencing an error or making an inaccurate judgment in itself does not lead to learning. Second, facilitating learning significantly relates to the undertaking of learning behavior after

experiencing an error and to improving an inaccurate judgment, while in the absence of learning, undesirable behaviors ensued. These patterns became apparent in the following key findings:

- (1) Not all junior auditors who made an error engaged in learning behavior.
- (2) Sharing an error with a colleague and engaging in learning from this error were distinct concepts that only correlated modestly, and that related to different drivers within the environment.
- (3) Without support, junior auditors who made an inaccurate judgment were unable to improve their judgment accuracy.
- (4) Junior auditors sought help for learning when having access to knowledgeable colleagues and in a supportive learning from error climate. In the absence of these factors, junior auditors did not engage in learning, but in coping behavior.
- (5) Auditors were able to improve on an inaccurate judgment when they were stimulated to reflect. In the absence of reflection, using a checklist was associated with an increase in confidence, but not with an increase in judgment accuracy.

The first three key findings illustrate that experiencing an error or making an inaccurate judgment does not automatically lead to learning. Even sharing an error with colleagues is not the same as learning from it. Within auditing, research on errors that auditors make themselves have focused on reporting of errors, assuming that through reporting, implicitly assuming that learning will occur because of reporting (Gronewold, Gold, & Salterio, 2013; Stefaniak & Robertson, 2010; Zhao & Olivera, 2006). The results of study 3 however suggest that this assumption should be carefully investigated. Workplace learning models clearly distinguish triggers of learning from mechanisms of learning (Eraut, 2004; Marsick & Volpe, 1999), and this conceptualization adds a currently understudied dimension to error management research in auditing. Findings (4) and (5) illustrate the second pattern: facilitating learning is necessary for enabling positive and avoiding negative outcomes. The firm's learning from error climate (Putz, Schilling, & Kluge, 2012) positively related to seeking help of high learning value, as did having easy access to knowledgeable colleagues irrespective of hierarchy (van der Rijt et al., 2013). Similarly, study 4 showed that auditors improved their judgment accuracy and some also reduced their overconfidence when being instructed to reflect. Auditors who were only provided with a checklist however not only failed to improve their judgment accuracy, but especially well-calibrated auditors became miscalibrated. These findings connect to

earlier studies that have called into question the effectiveness of checklists (for a review, see Boritz & Timoshenko, 2014), and also relates to studies outside of auditing and judgment and decision-making research that have found a positive interaction between different support forms and reflection (Anseel, Lievens, & Schollaert, 2009; Duijnhouwer, Prins, & Stokking, 2012; Gabelica, van den Bossche, Maeyer, Segers, & Gijssels, 2014). Hence, both studies provide further evidence that *"although all knowledge begins with experience, it does not follow that it arises from it"* (Charles Darwin). Knowing how much experience an auditor has reveals little about his or her judgment quality; only when the degree of learning from this experience is also known does a clearer picture emerge. Consequently, workplace learning needs to be actively facilitated and supported within firms to improve judgment accuracy, calibration, and learning from errors.

Theoretical Contribution

Through the interdisciplinary approach taken in this dissertation, taking a workplace learning perspective contributes to work in the adjacent domains of judgment and decision-making, expertise, and auditing research. Figure 6.4 illustrates these contributions. This section discusses five specific contributions that relate to the overlaps highlighted in figure 6.4. First, the overlap between judgment and decision-making with expertise research is discussed, followed by the overlap between judgment and decision-making and workplace learning research. Next, the overlap between workplace learning and expertise research is explored, before discussing new insights for auditing research.

First, exploring the role that limited validity plays in auditors' diagnostic reasoning generates implications at the overlap between judgment and decision-making and expert performance research. This overlap is explored by Kahneman and Klein (2009) as well as by Shanteau (1992). Both argue that environmental characteristics determine whether professionals are able to make consistently high-quality judgments. Shanteau (1992) proposes that experience will not be sufficient in limited-validity environments, but does not explicitly consider learning or knowledge. Kahneman and Klein (2009) go one step further; they formulate the explicit condition that professionals need to learn about their environment in order to make high-quality judgments. The results of this dissertation provide empirical evidence that indeed within auditing, not experience as such, but learning from experience determines judgment quality. These results align with Kahneman and Klein's (2009) theoretical assertion and show that in limited-validity

domains, not experience, but being able to develop knowledge from experience matters.

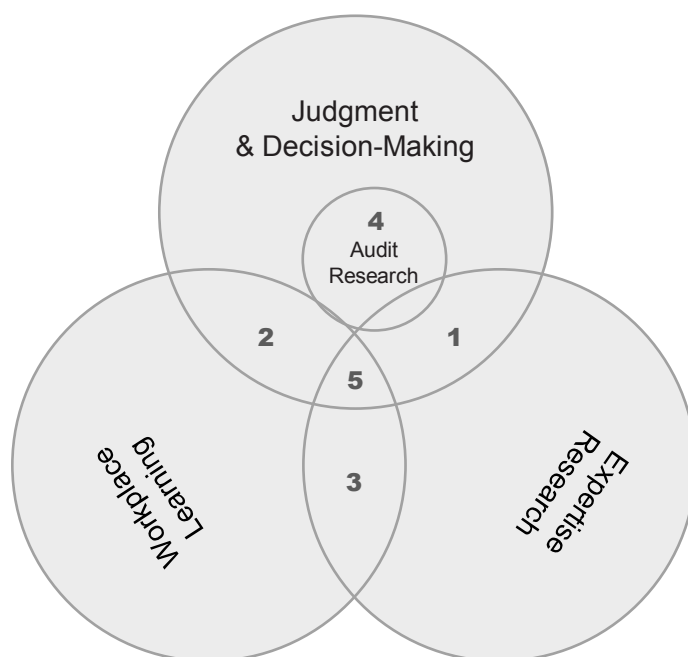


Figure 6.4. Theoretical contributions of workplace learning

Second, professional knowledge also plays a central in diagnostic reasoning (Croskerry, 2009; Einhorn, 1976), yet, developing knowledge is not yet explicitly considered in this context. Results of this dissertation however suggest that learning is an important factor within diagnostic reasoning. The diagnostic reasoning model developed within auditing (Einhorn, 1976) does not account for the development of knowledge, but considers auditors' knowledge and its relevance as a given. Going one step further, Croskerry's (2009) model includes a learning loop between successful pattern recognition and the absence of pattern recognitions. Professionals, in Croskerry's case healthcare professionals, will develop new knowledge when they are unable to detect a pattern in situational cues. This new knowledge then feeds into their ability to detect new patterns in the future. The model however does not include the need to stimulate this knowledge development but considers learning a given. The results of this dissertation suggest that for successful diagnostic reasoning to take place, models need not only consider knowledge as a given, but also account for the active development of knowledge from experience through workplace learning.

Third, the findings in this dissertation have implications for the overlap between research on workplace learning and research on expertise development research. In contrast to judgment and decision-making research, knowledge development is a central concept within expertise research. Deliberate practice, explored in the first study, is a much-discussed approach towards developing expert knowledge (Ericsson, Krampe, & Tesch-Römer, 1993; Salas & Rosen, 2010). In this approach, it is the design of specific learning activities that drives learning from experience. Two recent reviews have evaluated how much variance in performance is explained by time spent practicing deliberately (Hambrick et al., 2014; Macnamara, Hambrick, & Oswald, 2014). Both reviews found significant differences in amount of variance explained by deliberate practice across domains; significant variance was explained in music and games, while less than one percent of variance was explained in the professions. Macnamara et al. (2014) conclude that time spent practicing is not a useful tool for understanding expert performance. The findings in this dissertation however point to an alternative explanation. The concept of environmental validity may be a frame through which Macnamara et al.'s findings can be explained not as a function of how knowledge is developed, but as a function of environmental characteristics. High variance explained was found for high-validity domains and vice-versa. This implication in turn relates to the way that knowledge development is conceptualized. Instead of focusing on specific activities designed for learning (Ericsson et al., 1993), this dissertation highlights that within limited-validity environments, modeling learning in terms of mechanisms instead of activities can account for the flexibility required by the environment, enabling adaptive learning as part of professionals' actual experiences.

Fourth, the empirical investigation of workplace learning mechanisms adds to the scarce research of workplace learning in auditing. To date, only two studies have studied workplace learning among accountants and auditors (respectively): Hicks, Bagg, Doyle and Young (2007) and Westermann et al. (2015), of which only the second is published in an audit journal. Both studies are descriptive, using a survey and an interview approach to understand what drives accountants' and auditors' knowledge development at the workplace. On the one hand, the theoretical framework developed in this dissertation systematically connects literature from auditing with workplace learning. On the other hand, the studies presented in this dissertation provide empirical evidence on the relationship between workplace learning and judgment quality, professional skepticism, learning from errors, and calibration. Each of these outcomes can be managed by fostering learning from actual workplace experiences. The agenda for future

research outlined below provides avenues for how workplace learning can further benefit auditing research.

Fifth, and to conclude, the main theoretical contribution of this thesis is that workplace learning was shown to effectively enable auditors to overcome the constraints placed on them by limited environmental validity. Workplace learning was associated with higher judgment quality, a more skeptical attitude, learning from errors, and improvements in judgment accuracy and calibration. Consequently, workplace learning is a promising, but as of yet understudied, avenue for improving professionals' judgment quality in limited-validity environments.

6.3 | METHODOLOGICAL CHALLENGES AND INSIGHTS

Throughout the research for this dissertation, several methodological challenges with respect to operationalizing and measuring key concepts had to be addressed. This section outlines four specific challenges: the measurement of judgment quality, measurement of workplace learning mechanisms, the contextualization of findings, and the inclusion of actual performance data.

Measurement of Judgment Quality

At the center of the research presented in this dissertation lies the operationalization and measurement of judgment quality. Inherently, the relationships found are contingent on the outcome studied. Therefore, a careful balance needed to be struck between the desired depth of insight and the feasibility of data collection. This required considerations with respect to the kind of task chosen to elicit the desired behavior and the measuring of auditors' information search behavior and judgment accuracy.

The first consideration addressed the choice of task as a trigger of participants' behavior. After specifying judgment quality as the combination of information access, judgment accuracy and confidence, a task was chosen that is representative of auditors' actual work and that represents a task in which audit deficiencies have been found since the financial crisis. Moreover, this task is familiar to auditors across all hierarchy levels and industry specializations. Junior auditors are executing the task, managers supervise juniors' work, and partners need to assess the quality of judgments taken before signing off. The task is also sufficiently structured to

allow a distinction between relevant and irrelevant information, and between accurate and inaccurate judgments.

The next consideration addressed whether a single case or a series of cases would be most suitable to measure judgment quality. The current research question required sufficient variance in behaviors to form a basis for investigation. Paired with the limited time available on the part of participants, a single case was chosen. For research questions focusing on establishing whether professionals exhibit consistent performance at an expert level, multiple cases that allow direct comparison of behaviors are more suitable (Ericsson, 2014; Ericsson et al., 1993; Weiss & Shanteau, 2014). This however also requires a significantly higher time investment on the part of participants, a factor that should be taken into account in the conceptualization phase.

Following the choice and design of the task, a methodology for administering the case and for measuring judgment quality needed to be selected. This methodology required making the information search process explicit by tracking which information participants accessed before making a judgment. It had to allow for the presentation of realistic information that in this case was supplied by a collaborating Big 4 firm. Finally, this methodology needed to be flexible, allowing several participants to complete the case simultaneously, without posing a technological barrier. Within this dissertation, MouselabWEB (Willemsen & Johnson, 2010) met these criteria, while providing a sufficient level of insight (Ford, Schmitt, Schechtman, Hults, & Doherty, 1989; Gloeckner & Herbold, 2011).

Measurement of Workplace Learning Mechanisms

Exploring the role of workplace learning in auditors' judgment quality within the setting of this dissertation required measures that: capture auditors' actual experiences and perceptions at the workplace, are validated for professionals to compliment the newly developed judgment quality measures, and that are quantitative in nature to allow for hypothesis testing. Consequently, scales were chosen by Ashford (1986), Cartwright-Hatton and Wells (1997), Marsick and Watkins (2003) and Putz et al. (2012) and administered through an online questionnaire. This decision, given the requirements by the research question, was made with the awareness of common biases of self-report measures, such as social desirability. Another drawback of using self-report measures specifically for workplace learning was highlighted by Billett and Choy (2013) as well as Eraut (2004): learning that is completely integrated with daily work activities may not register with

participants as learning, leading them to potentially underestimating the amount of workplace learning they are engaging in.

Both of these drawbacks have been recognized by a stream of workplace learning research that focuses on qualitative measures or a triangulation of measures. For example, interviews offer the opportunity to trigger participants' memory of undertaking workplace learning, overcoming a potential lack of awareness on the side of participants. Instead of terms like workplace learning, error or failure however, many interview studies use profession-specific, neutral prompts (e.g. Mahajan, 2010; Tucker & Edmondson, 2003; Westermann et al., 2015). Next to interviews, other tools to measure professionals' workplace learning include experiential questionnaires (e.g. Billett, 2000), vignettes (Bauer & Mulder, 2013; Leicher, Mulder, & Bauer, 2013) or diary studies (e.g. Rausch, 2013; Schmitz & Wiese, 2006). These measures have the advantage of providing deep and contextualized understanding of the occasions, strategies and outcomes of workplace learning, but do not allow for hypothesis testing, representing a second trade-off to be considered.

Contextual Nature of Findings

The research questions investigated in part I and part II of this dissertation required two different sampling strategies. The sample in part I needed to have sufficient variance in amount of task experience, but also needed to avoid noise in the workplace learning data. Consequently, data were collected within several offices of one audit firm (limiting noise in the variables influenced by the firm environment), but allowing to include auditors from all function levels (contributing to variance in task experience). The sample in part II however had different requirements. The sample in part II needed to meet opposite criteria; it had to be fairly homogenous with respect to amount of task experience, but provide sufficient variance in workplace learning perceptions. The data collected therefore kept function level constant, instead of firm membership. These choices made based on the requirements derived from the research questions were weighed against considerations of generalizability. While analyzing the data, it became very apparent that auditors across different offices within the same firm perceived their learning environment differently, and also indicated different levels of skepticism. These office-level effects were particularly strong among partners, but insignificant among junior auditors. This may be the result of socialization (Morrison, 1993) or of little structural overlap between different offices in the same firm (Hinds & Pfeffer, 2003; Ricketts, 1994; O'Dell and Grayson, 1998). The latter studies found that knowledge sharing

between different locations of one company was not larger or smaller than knowledge sharing between different companies, concluding that "organizations don't 'know what they know'" (Hinds and Pfeffer, 2003, p.3). Applied to the choice of sampling strategy, these findings may indicate that including several firms within the same industry may not necessarily introduce more noise to the data, and in turn may increase generalizability. At the same time, this does not allow predictions on the effect of including firms or organizations across industry boundaries. This dissertation has relied on Shanteau's (1992) characteristics to describe the audit profession's validity. This approach may also be useful when including organizations from different industries in the same study. In this case, professions with environmental validities similar to auditing may be radiology, taxation and aviation, pending future research.

Including Auditors' Actual Performance Data

The research question at the center of this dissertation required the collection of judgment quality data that is comparable across participants, that is based on controlled situational cues, and that allows testing the effects of different support mechanisms. Consequently, an experimental approach towards research was chosen. A drawback of this approach however is that auditors' performance on this specific task may not be fully representative of their performance on the same task in practice. This drawback is avoided through an archival approach, in which data provided by audit firms are analyzed for patterns (e.g. DeFond & Zhang, 2014). This data represents auditors' performance across a variety of indicators and includes information about the individual auditor, the audit firm, the specific engagement, and the client being audited. However, archival data also have several drawbacks: measures may be operationalized differently across firms and data is collected for quality assurance, not research purposes, potentially limiting validity. Within auditing, two, largely separate, research traditions have developed around these two data types. However, the two types of data are not per se mutually exclusive; they represent a trade-off between representativeness and comparability that needs to be balanced depending on the specific research question.

6.3 | AGENDA FOR FUTURE RESEARCH

Based on the discussion of findings and the methodological considerations and insights, several avenues for future research emerged. This section discusses three avenues based on the key findings in this dissertation. First, based on the finding that critical experience related more positively to judgment quality than task experience, the first avenue focuses on different types of experience as triggers of workplace learning. Second, relating back to the findings that auditors with different amounts of experience exhibited different judgment quality and also benefited from different workplace learning mechanisms, the second avenue explored potential benefits of a longitudinal research design. Third, given the current focus on an individual task, future research may take into account the nested nature of work and by consequence learning in the audit setting. Finally, based on the social nature of the workplace learning mechanisms explored in this dissertation, a bi-directional influence between the individual auditor and his or her environment is assumed, leading to the last avenue, exploring social contagion effects within audit teams. Each avenue is discussed in turn.

Exploring Different Types of Experience and Emotions as Learning Triggers

The first study in this dissertation revealed that whether or not auditors had made critical experiences positively related to participants' judgment, and more strongly so than amount of task experience. Following this finding, as well as the observation in part II that having a specific experience (such as an error or an inaccurate judgment) does not necessarily lead to learning, this first avenue for future research is suggested: under which conditions do different types of experience effectively trigger workplace learning?

The informal learning theory of Marsick and Volpe (1999) stipulates that workplace learning occurs when triggered by an internal or external jolt. This jolt can come from a variety of experiences: an inaccurate judgment or error, as considered in this dissertation. Several other experiences however may also be effective triggers. In auditing research, attention is paid specifically to auditors' experience with fraud (Knapp & Knapp, 2001; Rose, 2007). Several studies have shown that fraud experience is associated with better detection of fraud (Fathil & Schmidtke, 2010), more attention to indicators of aggressive financial reporting and higher perceived likelihoods of error- over non-error explanations (Rose, 2007). Rose (2007) concludes that fraud experiences has allowed auditors to develop different knowledge than auditors without fraud experience, a result that is very similar of findings in this dissertation with respect to critical experience. Outside

auditing, several other domains are focusing on critical experience as triggers for learning, each focusing on domain-specific experiences that force the professional to alter their course. For example, in the entrepreneurship literature, critical incidents such as the failure of a project or start-up have been shown to play key role in learning (Cope, 2003; Cope & Watts, 2000). Literature focusing on managerial learning also highlights the importance of experiences that challenge leaders' notions and force them to adapt, such as difficult supervisors, hardship, crises (McCauley, Ruderman, Ohlott, & Morrow, 1994; Tesluk & Jacobs, 1998). The same relationship can be found in healthcare literature focusing on learning from errors (e.g. de Feijter, de Grave, Koopmans, & Scherpbier, 2013; Tucker & Edmondson, 2003). What these studies have in common is that whether an experience can be considered 'critical' or not depends on the individual; an experience that unsettles inexperienced professionals may be a routine situation for their more experienced colleagues (Cope & Watts, 2000). This is a property of critical experience that needs to be taken into account when selecting measures. Knowing of the effect that critical experience has on the knowledge development of professionals, further research is needed to understand the role that specific learning mechanisms and contextual factors play in the learning process. Existing measures that are able to account for individual perceptions and emotions connected to critical experience are largely qualitative. The critical incidents technique (CIT) is one example (Flanagan, 1954). In its origin, the technique is highly detailed and requires an extensive sample, but more recent adaptations of the method have established its validity across smaller samples and a variety of experiences (Andersson & Nilsson, 1964; Edvardsson & Roos, 2001; Mahajan, 2010; Smith & Russell, 1991). Other studies use phenomenological interviews (Cope, 2003) case studies (Roos, 2002) and experiential questionnaires (Billett, 2000). In exploring these relationships, emotions (such as stress, shame, even anger) are likely to play a moderating role, and this relationship is not necessarily linear. Too shallow or intense emotions may limit professionals' motivation and ability to learn respectively, indicating an inverted-U shape. These considerations lead to the following questions to inform future research:

- (1) Does workplace learning foster learning from critical experiences that differ in type, environment and consequence?
- (2) What is the relationship between emotional intensity of a critical experience and learning from this experience?
- (3) Which workplace learning mechanisms at the individual, supervisor and firm level enable professionals to manage their emotions for learning?

Exploring Longitudinal Effects in Professionals' Workplace Learning

The studies in part I of this dissertation have found differences in judgment quality and workplace learning across auditors with different amounts of experience. These results were of course obtained through a cross-section design, allowing the establishment of relationships, but limiting the kind of research questions that can be asked. Consequently, a second avenue for future research is presented: which questions with respect to the relationship between workplace learning and judgment quality could be addressed through a longitudinal design?

Several characteristics of the audit sector actually lend themselves to longitudinal research. For example, in part I of this dissertation, the correlation between overall audit experience and firm tenure exceeded 0.95; auditors especially at higher ranks tend to stay in the same firm across their career. Consequently, in a longitudinal study, some parameters could be considered as relatively stable (such as the audit methodology used, rules and regulations, incentives), to which all participants would be equally exposed. At the same time, variance stems from individual auditors' changing team memberships, client interactions and changing tasks across hierarchy levels. In this sense, auditing allows for a structurally clear distinction between effects at the first, the team, and the individual level. This longitudinal approach opens up several new research questions on the relationship between workplace learning and judgment quality that derive from the benefits of longitudinal research design (e.g. Shadish, Cook, & Campbell, 2002). First, longitudinal research allows the exploration of learning trajectories that occur as a response to environmental triggers, to individual characteristics, and to workplace learning mechanisms, enhancing validity of findings. Second, next to establishing such trajectories, the relative impact of these three categories of variables can be gauged, providing deeper insight into relevant levers for improving judgment quality or calibration. Third, a longitudinal design is capable of taking into account the ongoing changes in most professional environments, not just in auditing. At the same time, longitudinal data is difficult to collect due to the required sample size, possible attrition (which may be less problematic especially at the higher function levels in audit firms), and the demand it places on participants and firms. Despite these challenges, longitudinal data on workplace learning trajectories could address questions such as:

- (1) Do task experience and critical experience lead to different learning and performance trajectories?
- (2) Do professionals benefit from critical experience in the beginning of their career, triggering learning early, or rather towards the end of the career, to overcome potential complacency and reliance on past knowledge?
- (3) Under which conditions is the influence of environmental / personal / workplace learning characteristics the strongest?

Exploring Partner Learning

The first two studies in this dissertation showed that partners, those auditors with the most experience and the most responsibility were not immune to making low-quality judgments. Indeed, task experience was negatively related to amount of evidence collected as well as to judgment accuracy. These findings highlight a third avenue for future research: how can partners continue to learn even though they do not execute baseline audit tasks themselves?

Work within auditing is organized in teams. For each client (engagement), a team is assembled consisting of a partner, and a number of managers and juniors (depending on client size), with team members performing nested tasks depending on their rank. Each partner leads several engagement teams, and in each team, for each audit, the partner forms higher-order judgments, assessing both the quality of information provided by the client as well as the quality of work done by the engagement team members. This double role creates a unique learning challenge for partners: they need to assess judgment quality of others on tasks they have performed in the past but are not currently performing themselves (Abdolmohammadi, 1999). This challenge means audit partners need to apply knowledge developed on past engagements to new engagements without being familiar with the intimate details of the dossier.

Ongoing workplace learning therefore is crucial to enable partners to fulfill this double role adequately. Yet, the environment in which partners perform this task may be less conducive to learning; the tasks are less structured (Abdolmohammadi, 1999), feedback and help may be less readily available due to the limited number of partners in the firm, and time pressure is extreme (e.g. Peytcheva & Gillett, 2011). Simultaneously, partners take responsibility for their team towards the audit firm, as well as to oversight

bodies. Consequently, partners may have different learning needs than juniors, seniors or managers. Future research may therefore zoom in on partner learning, exploring research questions such as:

- (1) What are the most relevant sources of workplace learning, specifically feedback and help, for audit partners?
- (2) Do audit partners who work in a supportive learning climate engage in workplace learning with engagement team members at lower hierarchy levels?
- (3) Which kind of experiences trigger audit partners to develop the necessary knowledge to recognize low judgment quality in the work of their engagement teams?

Exploring Contagion Effects

The workplace learning mechanisms studied in this dissertation cover inherently social interactions, such as the exchange of feedback and help, the tie characteristics that enable learning from errors, and the perception of the learning (from error) climate. The consistent finding that these mechanisms significantly and positively relate to judgment quality suggests a fourth avenue for future research: is workplace learning and judgment quality 'contagious'?

The conceptual model underlying this dissertation hypothesized a one-directional influence of the social environment on individual's judgment quality. Taking this conceptualization one step further, taking into account bi-directional effects, future research may gain deeper insight into the social component of workplace learning in terms of contagion effects. Social / behavioral contagion describes the spreading of ideas, actions or attitudes by social contact (Christakis & Fowler, 2013; Wheeler, 1966). In the current research context, social contagion can be expected to take place within engagement teams. For each client (engagement), a team is assembled consisting of a partner, and a number of managers and juniors (depending on client size), with team members performing nested tasks depending on their rank. In this nested setting, characteristics and behaviors of supervisors are expected to influence characteristics and behaviors of team members. The audit setting actually provides a unique opportunity for studying contagion effects. Each partner acts as a team leader for multiple engagements each year. Similarly, engagement team members act on several teams, and from one year to other, some team members remain

with a specific engagement / partner, while others change engagements. This set-up allows testing for contagion effects in two ways. First, within the same year, are correlations in workplace learning (professional skepticism / overconfidence etc.) more similar within and between teams guided by the same partner compared to teams lead by different partners? Second, across years, are correlations in workplace learning (professional skepticism / overconfidence etc.) higher across teams guided by one partner than across teams guided by different partners? Understanding the drivers behind desirable and undesirable behaviors in bi-directional terms provides audit firms with more knowledge about the level at which interventions may improve audit quality. These considerations inform questions for future research such as:

- (1) Is workplace learning behavior / skepticism / overconfidence contagious across the audit team hierarchy?
- (2) Are contagion effects the result of deliberate or unconscious processes?
- (3) Can judgment quality / skepticism / overconfidence best be improved through interventions at the highest, medium, or lowest hierarchy levels within audit teams?

6.5 | IMPLICATIONS FOR PRACTICE

The research in this dissertation was conducted within and in close collaboration with the audit profession; consequently, implications for practice are formulated with this specific context in mind. At the same time, literature exploring other professions is included in this section, as the mechanisms of workplace learning have previously been researched across several environments. The implications formulated in this section are rooted in the nature of the workplace learning mechanisms, which were chosen because they make judgment quality manageable at all levels of a firm: the individual, the supervisor, and the firm level. As these levels are nested in each other, fostering workplace learning at each level is dependent on conditions created at higher levels.

Individual-Level Implications

Within this dissertation, two related variables were studied that pertain to the individual level: engaging in meta-cognition (study 1 and 2) and

reflection (study 4). Reflecting and monitoring one's judgments are the catalysts through which experiences are transformed into knowledge (e.g. Daudelin, 1996; Feltovich, Prietula, & Ericsson, 2006; Sternberg, 1998). For this catalyst to function well, several conditions need to be met. First, professionals need to have sufficient opportunity for reflection. Second, professionals require valuable and accurate inputs, for example performance feedback (e.g. Stone & Opel, 2000), but also feedback that sheds light on specific ways in which the professional can improve in a specific situation (e.g. Ashford, 1986; Shute, 2008). Third, professionals will require help with figuring out the causes of a specific outcome, such as an error or an inaccurate judgment. The team in which auditors judge and learn therefore plays a crucial role. Even though formally, audit work is organized in teams, many tasks are executed individually, which limits the opportunity for learning. Moreover, to seek help that is valuable for learning, individuals require access to those colleagues who possess relevant knowledge for helping, across hierarchy and team boundaries (Bamberger, 2009; van der Rijt et al., 2013). This requires that individuals are aware of their colleagues' expertise, and need to be able to access them quite easily (Bamberger, 2009). Each of these inputs, along with (critical) experiences then needs to be processed: analyzed, compared to earlier experiences and existing knowledge, and used to draw conclusions on how to handle similar future situations (Schön, 1983). To engage in meta-cognitive activities such as monitoring and reflection, and to be able to seek feedback and help, individuals require an environment that not only accepts this behavior, but in which it is valued and supported (e.g. Eraut, 2007; Marsick & Watkins, 2003). This information is encoded in the firm's learning (from error) climate, determining whether efficiency, driven by time pressure, or learning, requiring time investment, is valued more (Edmondson, 2008). Each individual however has very limited influence on the climate (Marsick & Watkins, 2003; Putz et al., 2012). Consequently, workplace learning at the individual level, whether undertaken by a junior, a manager or a partner, is thus nested in the wider learning environment of the firm.

Supervisor-Level Implications

The supervisor level is the first level of nesting: auditors who supervise others (experienced juniors, managers and partners) therefore have a double role. On the one hand, they are learning individuals and therefore dependent on their social environment (see 'individual-level applications' above). On the other hand, they considerably shape the learning environment for those they supervise (Edmondson, 2011; Putz et al., 2012). In this dissertation, two variables have been studied that relate to the role of

the supervisor in fostering workplace learning: providing feedback and providing help, in addition to offering support for meta-cognition and reflection. Each of these demands requires that supervisors possess knowledge on how to support reflection, how to provide feedback and how to encourage help-seeking. This knowledge can develop from personal interactions, but can also be acquired through coaching or mentoring (Westermann et al., 2015). Beyond the immediate interactions with their colleagues, supervisors can also encourage the seeking of feedback and help across team and hierarchy boundaries, for example by referring their team members to knowledgeable colleagues, by assigning shared tasks to auditors who can benefit from each others' experience and by allowing for time to socialize and network within the firm. Critically, all of these opportunities can be integrated with existing structures and procedures on which teams rely for efficiency. Facilitating workplace learning therefore is not disruptive to routines - it supplements and elevated them. Workplace learning at the supervisor level however is contingent on supervisors' beliefs about the role that workplace learning plays in the firm. Here, supervisors face a second nested role. On the one hand, their behavior is a tangible indicator of the firm's learning (from error) climate and consequently has a large influence on the behavior of their team members (Edmondson, 2011, 2012; Putz et al., 2012). Within their teams, supervisors can foster workplace learning through role modeling: admitting to own errors or recounting critical experiences, offering support and resources for learning, rewarding and sharing the knowledge that develops through workplace learning, and emphasizing a balance between short-term efficiency and long-term effectiveness (Edmondson, 2012; Putz et al., 2012). Each of these behaviors signal to team members which behaviors are acceptable in the team; in this way, supervisors can create a supportive learning (from error) climate within their teams. Here again, time pressure is a key factor, as it limits both the opportunity for supervisors to learn, as well as the opportunity to support their team members' workplace learning. Providing feedback, listening and engaging in reflection and help-seeking all takes time that does not necessarily pay off immediately. On the other hand, supervisors themselves are acting within the wider firm environment in which they may not influence the learning (from error) climate. Taking into account the wider firm climate leads to two additional considerations. Cha and Edmondson (2006) for example studied the phenomenon of leader hypocrisy: when the values communicated by the leader differ significantly from the values perceived by individuals, team members can become 'disenchanted', leading to negative perceptions of the leader and the firm. Next to this within-team effect, supervisors' engagement in and support of workplace learning will depend on how they perceive the wider learning climate in the firm.

Firm-Level Implications

The firm level is the highest in the nested structure. It is here that the values governing behaviors within the firm are determined and reinforced. Consequently, at the firm level, the design of an environment that enables workplace learning is central. A supportive climate enables individuals to invest time in meta-cognition, encourages the seeking and providing of feedback and help, lowers the cost of workplace learning across hierarchy and team boundaries, and values and distributes the knowledge created by individuals and teams in the firm (Edmondson, 2008; Marsick & Watkins, 2003; Putz et al., 2012). A firm's learning (from error) climate is shared through internal communications, formal and informal incentives, and through the way in which work is organized (Clarke, 2006; Marsick & Watkins, 2003). Each of these avenues therefore provides opportunities for deliberately designing an environment in which ongoing improvement is valued as much as efficiency in the short term. Internal communications need to be perceived as integral, which means that the values communicated explicitly need to match the values communicated implicitly, e.g. in promotion decisions and in the assignment of responsibilities (Cha & Edmondson, 2006). Along with valuing workplace learning, firms also need to dedicate resources to it: allowing for small chunks of time dedicated to learning, the fostering of individual auditors' professional networks through conscious work assignments, and mobilizing support for teams that make significant errors without punishing them. However, the positive outcomes of a learning climate can potentially impose a cost on audit firms. Efficiency lies at the center of audit firms' business model; 'outsourcing' learning to formal training consequently allows focusing on 'billable hours'. The integrated approach of workplace learning however challenges the notion of what constitutes billable time. Naturally, a client prefers a low budget that only includes core tasks, favoring firms that do not invest in ongoing learning in the short term, but limiting these firms' ability to improve audit quality over time. Balancing between short- and long-term goals therefore is constrained by competitive pressures between firms. A second, and related, constraint may be imposed (unwittingly) by oversight bodies. Former NBA chair Huub Wieleman's quote in the introduction illustrates this issue: *"everyone is scared to death that they may be punished for not following the rules. This culture of fear leads to a very detailed interpretation of the rules. We thereby start with principles, but end with rules. We still have a lot to learn here"* (Piersma, 2015). Current incentives designed to foster a quality-centered culture in audit firms (AFM, 2015), may actually impede learning. A fear of making mistakes not necessarily reduces the number of mistakes made, but rather the number of mistakes reported (Mahajan, 2010; Zhao & Olivera, 2006). The AFM is however faced with a unique opportunity; at a

time in which all audit firms are urged to improve audit quality, the AFM can create conditions in which workplace learning can become a priority next to efficiency. By rewarding learning and communicating firms' workplace learning efforts, the AFM can encourage firms to increase quality through learning, can offer a transparent manner of restoring trust in the industry, and can help audit firms attract auditors who value learning and come to see it as an integral part of their work.

6.5 | CONCLUSIONS

How can professionals be supported in making high-quality judgments in environments that constrain their performance? This dissertation took an interdisciplinary approach towards answering this research question, developing a theoretical framework based on judgment and decision-making, expertise research as well as workplace learning research to an audit setting. Specifically, the studies investigated how a firm's supportive learning (from error) climate, the provision of valuable feedback and seeking of help, and the engagement in meta-cognitive activities enable auditors to make high-quality judgments, do develop a skeptical attitude, to learn from their own errors, and to improve inaccurate judgments and calibration. Across studies, it was found that it is not the amount of task experience that determines these outcomes; rather, it is the degree to which auditors are able to learn from their experiences. Without support for workplace learning, auditors performed worse than their learning peers - without being aware of it; they demonstrated overconfidence. To conclude, audit firms can address the challenges imposed by their environment by deliberately designing an environment that enables all members of a firm, from junior to partner, to effectively learn from actual experiences at the workplace - the challenges imposed by limited validity can be overcome.

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CHAPTER 7

VALORIZATION ADDENDUM

"Ever tried. Ever failed. No matter. Try again. Fail again. Fail better."
- Samuel Beckett

7.1 | PURPOSE

The research presented in this dissertation was designed with the explicit purpose of providing organizations with a better understanding of how to improve professionals' judgment quality. In order to achieve this goal, the perspective of workplace learning was chosen. Learning, the process of acquiring new knowledge through experience or novel applications of existing knowledge (Eraut, 2004), is an inherently adaptive process. It allows professionals to continuously improve their judgment quality, and to adapt to continuously changing environments. Over the past three years, insights from the research included in this dissertation, as well as from related projects, have been shared with numerous professionals from domains as diverse as auditing, the petrochemical industry and Learning & Development at private firms and Maastricht University; presentations at specific firms, workshops for the Foundation for Auditing Research, the Dutch Institute of Psychologists, the Institute for Physical Safety, and the Ministry of Infrastructure and Environment. These valorization activities undertaken as part of this PhD project are discussed further below, and followed by an outline of upcoming valorization activities related to this dissertation.

7.2 | CURRENT VALORIZATION ACTIVITIES IN AUDITING

The research presented in this dissertation was carried out in the audit context. Most of the measurements were developed in collaboration with one Big 4 firm, to ensure the relevance of the results for practice. Throughout a three-year trajectory, results have been shared with the participating firm, as well as with other audit firms through the Foundation for Auditing Research. A series of workshops were conducted focusing on two key outcomes of this dissertation: improving judgment quality and learning from errors. These workshops were given to representatives of all

function levels within the audit firms, and also shared in meetings together with members of the departments for quality assurance and compliance.

The starting point of these workshops was the sense of urgency felt by audit firms to further improve the judgment accuracy of their members. An underlying problem that surfaced throughout the interactions with the audit context was the desire to manage the inherent uncertainty of the audit domain (Kahneman & Klein, 2009; Knechel, Krishnan, Pevzner, Shefchik, & Velury, 2013; Shanteau, 1992). This uncertainty appears to be addressed within the audit industry mostly through the (re)design of incentives and procedures, so that tasks become more structured, leaving less room for judgments in order to avoid errors (MCA, 2016; Brouwer, 2017). The research discussed in this dissertation complements these measures. Research on how auditors learn at the workplace provides insights on how these professionals continuously develop new knowledge that allows them to adapt to changes in their work environment. Both perspectives are inherently related: auditors need to possess relevant knowledge to form high-quality judgments; this knowledge then forms the basis for incentives and procedures to stimulate desirable behaviors. Without acquiring the necessary knowledge first, incentives and procedures may not be effective simply because auditors are not able to make better judgments.

The present research identifies four drivers of judgment quality at four different levels, as illustrated in figure 7.1. The task environment, especially when characterized by low validity, will provide individuals with the experience of errors and other critical incidents. This has been shown (especially in chapter 2) to be a significant and positive explanatory factor of judgment quality. In workplace learning literature, external jolts such as errors and critical experience have been identified as critical triggers of the workplace learning process (Eraut, 2004; Marsick & Volpe, 1999). At the firm level, these critical experiences require an environment in which this kind of behavior is not only acceptable, but even more it is encouraged by the organization (Marsick & Watkins, 2003; Putz, Schilling, & Kluge, 2012). Creating a supportive learning (from error) climate communicates to members of an organization which behaviors with respect to learning are desirable. By rewarding the reporting of critical experiences, by role modeling successful learning, by sharing the resulting knowledge, leaders in an organization can effectively design an environment in which all members are enabled to learn. The role that learning (from error) climate plays in professional judgment quality has been especially explored in chapters 3, 4 and 5. A supportive climate for example encourages individuals within the firm (both within and across hierarchy levels) to exchange valuable feedback (chapters 2 and 3) and to provide help to each other (chapters 4

and 5) (Ashford, 1986; van der Rijt et al., 2013). In both cases, each individual, at any level within an organization, can contribute to their own and their colleagues' learning by knowing how to provide effective feedback and help. Finally, the individual professional needs to process the information received from the critical experience itself, by observing others' learning, and information received through feedback and help. Reflective behavior is necessary to, categorize information and create abstract new knowledge that the individual can apply to future events (Boud, Keogh, & Walker, 1985; Kahneman & Klein, 2009; Mezirow, 1990). This learning behavior is inherently nested within the work, and provides opportunities for audit firms and individual auditors to actively improve judgment quality as part of daily practice.

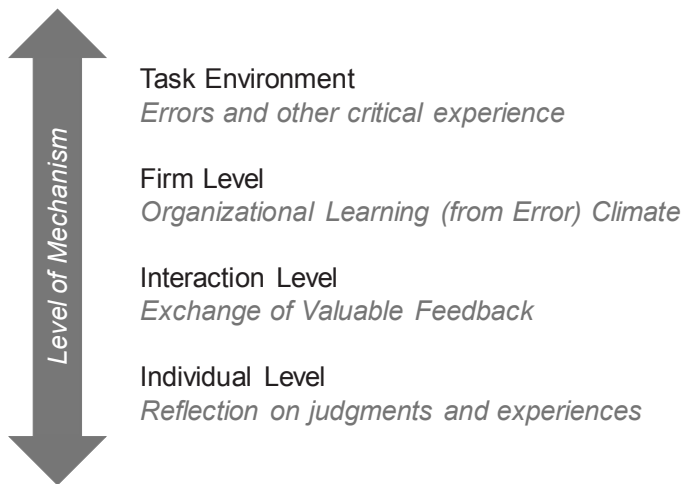


Figure 7.1. Learning mechanisms that drive professionals' judgment quality

7.3 | CURRENT VALORIZATION ACTIVITIES IN OTHER DOMAINS

In addition to sharing the findings of the present PhD thesis with professionals in auditing, related projects were conducted resulting in presentations, workshops and teaching modules for the Dutch Ministry of Infrastructure and Environment, petrochemical companies, the Institute for Physical Safety, the Dutch Institute of Psychologists (NIP), a leading consultancy firm in the Benelux, as well as postgraduate education at Maastricht University. In these meetings, talks focused on how making changes in learning behavior affects judgment and decision-making in complex environments. In the petrochemical industry for example, professionals may face sudden crises in which judgments and decisions

have to be taken under significant time pressure and are associated with high stakes. For example, in collaboration with a colleague outside of the research team behind this dissertation, a series of trainings was developed for chemical engineers who are preparing for coordinating crisis management efforts at a chemical park. The goal of this training was to help future teams to prepare for coordinated judgment formation using the BOB framework (beeldvorming - oordeelsvorming - besluitvorming). This framework aims to structure the judgment process in high-reliability contexts by focusing first on collecting the available evidence, then checking multiple interpretations of the information at hand, before resulting an appropriate decision and plan for action. The BOB framework was used to create awareness to learn systematically how to behave in the event of a crisis, so that the chemical engineers can rely on automated processes in the moment of a crisis that enable bias-conscious judgments and decisions. In these workshops, behaviors of team leaders and members were addressed. Especially the role of structuring behavior and constructive critical communication was emphasized as a means to enhance the group's judgment process. On the individual level, speaking up and exchanging feedback were practiced as a means to avoid common biases, such as overconfidence, confirmation and group think. These workshops resulted in a series of follow-up projects with several firms in the same industry, who all recognize the value of learning and adapting for making high-quality judgments, similar to the participating audit firm.

7.4 | FUTURE VALORIZATION ACTIVITIES

Based on the research presented in this dissertation and on the current valorization activities, several opportunities for future valorization exist. As part of the 53-points plan devised by the NBA (2014), in 2015, the Foundation for Auditing Research (FAR) was founded to connect research to practice with the objective to increase audit quality. All research funded by FAR is selected both by academics and practitioners, and is provided with several opportunities for valorization, including master classes for the participating audit firms, practice notes to be shared via popular outlets in the audit domain, and several (international) conferences to be attended by practitioners and academics alike.

A research project following up on the findings presented in this dissertation received a grant FAR, again with the specific goal to create research relevant for practice. The follow-up project translates the key findings of this project to the team setting, by exploring (1) the relationship between audit quality and team learning behaviors, (2) antecedents of team learning

behaviors at the individual, leader and unit level, and (3) the impact of team learning behavior on changes in audit quality over time (see figure 7.2). The research design includes questionnaires experiments as well as actual performance data provided by the firms themselves, and the research team includes experts on audit quality, team research, and developing minimalistic interventions in practice. Key research questions of this project include:

- (1) Which team learning behaviors are related to audit teams' judgment quality and audit quality?
- (2) Which team learning behaviors affect changes in audit quality over time?
- (3) How do auditors' individual characteristics and characteristics of the work environment interact to produce effective team learning behaviors?

By exploring these relationships, we are hoping to provide audit firms with specific levers of audit quality, this time explicitly taking into account the hierarchical structures in which auditors operate. Among the deliverables of this follow-up project are insights into existing team learning patterns within audit firms, monitoring tools for measuring and steering effective drivers of team learning, and insights into the levels at which audit firms can affect audit quality through team learning behaviors.

In the context of this FAR project, several valorization activities have been executed already and planned to take place. A master class was held for audit practitioners, regulators and researchers that made the role of workplace learning in audit quality accessible to the audience in an interactive manner (Foundation for Auditing Research, 2016). A version of the master class will also be provided to members of the AFM later in 2017. Moreover, a practice note will be published in outlets such as *accountant.nl* that summarizes the value of the new project for audit practice. During the second international FAR conference this year, further exchange with practice is fostered through interactive sessions. Next to FAR-guided valorization activities, our connections with participating audit firms mean that our insights remain accessible to practitioners pending new results.

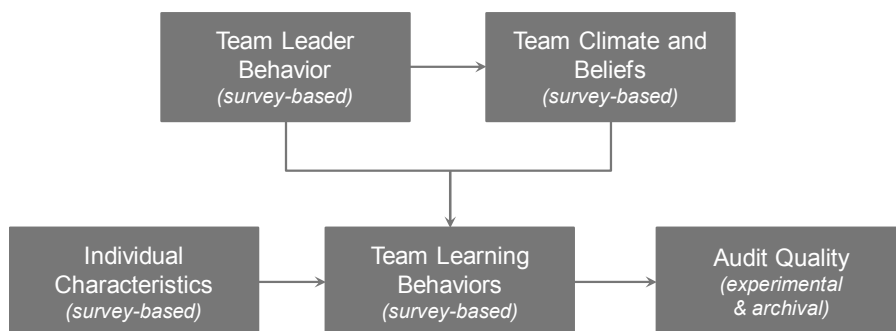


Figure 7.2. Conceptual model of the first follow-up project on the team level

Recently, a second project was submitted for consideration to FAR to provide data collection opportunities for a PhD candidate as a second follow-up to this PhD dissertation. The second project addresses audit quality not through a judgment and decision-making lens, but rather focuses on what enables auditors to strike a balance between pressures for efficiency (e.g. time and budget pressures) and pressures for quality (as expected by e.g. the AFM). Additionally, instead of focusing on the environment's low validity, this project investigates auditors' ability to adapt their approach to balancing efficiency and quality to differing levels of client risk. The conceptual model of this second follow-up project focuses on personal attitudes (such as grit, having a growth mindset, and having a dispositional need for closure) as well as leader behavior and psychological safety as explanatory factors enabling auditors to balance efficiency and audit quality (figure 7.3). Key research questions of this project include:

- (1) Which personal attitudes and which leader behaviors affect auditors' focus on efficiency vs. quality when faced with different levels of client risk?
- (2) Do a match or clash in personal attitudes across hierarchy levels influence adaptive balancing of efficiency and quality?
- (3) How do individual attitudes and leader behaviors / psychological safety / firm culture interact to enable optimal balancing of efficiency and quality, given client risk?

The value for practice of this project lies in the multilevel approach of understanding positive and negative interactions between hierarchy levels of audit firms. It will provide audit firms with specific tools for team composition and optimal leadership that help balancing efficiency and quality, given client risk. If the project gets accepted, then the valorization

potential of the second follow-up project is the same as for the first, ensuring a long-term collaboration with practice and ongoing valorization of our research findings.

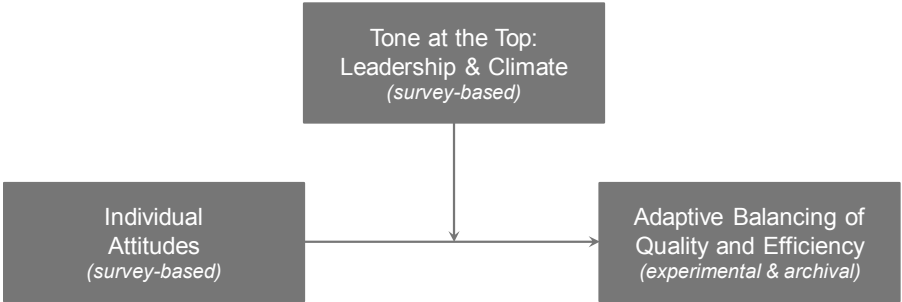


Figure 7.3. Conceptual model of the second follow-up project on the team level

7.5 | CONCLUSION

In conclusion, research presented in this dissertation has been designed with the specific purpose of informing practice, and has been carried out in close collaboration with the audit industry. Focusing on workplace learning as a complementary perspective to incentives and regulatory efforts has resulted in new insights of how audit firms can actively facilitate workplace learning as part of daily activities. The benefits of the workplace learning approach lie in the malleability of all variables, and its inherent adaptive nature, suited for ongoing performance improvement in low-validity environments. From jointly developing representative tasks to regularly sharing and discussing findings, research presented in this dissertation has been valorized not only in auditing, but in other fields as well. Ongoing and future valorization activities are being developed to enable auditors to make high-quality judgments by designing effective learning environments.

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APPENDICES

RESEARCH INSTRUMENTS

ABOUT THE AUTHOR

LIST OF PUBLICATIONS AND VALORIZATION ACTIVITIES

APPENDIX I

CASE USED TO MEASURE JUDGMENT QUALITY IN PART I

INSTRUCTIONS PROVIDED TO PARTICIPANTS

Start

You are about to read a description of your client Seret Sport. In your current function, you are involved in the control of the financial statements at the end of the financial year. After a general description of your client Seret Sport, you will find the need to make a decision similar to work with clients in your actual portfolio.

Please follow the directions on this paper and in the online environment. After working on the case study, we are asking you to fill in a questionnaire. Overall, we expect this task to take 30-35 minutes.

The anonymity of all participants is guaranteed. Your answers will be treated confidentially and can only be accessed by the research team. Results will only ever be presented in aggregated form, so that individual contributions will not be recognizable.

If you have further questions, please contact Therese Grohnert via

t.grohnert@maastrichtuniversity.nl.

Thank you for your participation!

Kind regards,

Therese Grohnert, Roger Meuwissen & Wim Gijssels

CASE: SERET SPORT

Background

Seret Sport BV is a company producing and selling sports equipment and accessories. The board consists of Mr. Schiffmacher and Mr. Vervoort, who each own 20% of Seret Sport. The other 60% is in the hands of a group of private investors, each with a minority interest. Seret Sport employs a total of 130 people. Net profit before taxes has increased gradually from €1.2 million in 2012 to a reported €1.4 million in the current fiscal year 2015. Revenue increased consistently by 3% per year, to a reported €120 million in 2015.

Seret Sport is operating in a steadily growing market for high-quality sports equipment. Excellent knowledge of the market and the continuous search for innovative products has so far created a stable growth in revenue. Even though the market in which Seret Sport operates is becoming more and more competitive, the board feels that Seret Sport can continue to develop as they currently do. Indeed, the combination of a very competent purchasing and sales staff, a good reputation, the products' high quality and the good value for money of Seret Sport's products, the company has managed to keep its expected competitive advantage.

Your audit firm has been auditing Seret Sport's financial statements for the past four years and this year is hired again to perform the end of year audit of the financial statements. Your firm has a good and professional relationship with Seret Sport, and both the board and the employees of Seret Sport are cooperative with you overall. The company does not have an aggressive reputation with respect to earnings management. You as auditor have perceived the system of internal controls of Seret to be of high quality, and during previous audits, few audit differences were found. The audit environment at Seret Sport has always been rated as sufficient.

Also, you have a realistic audit budget. Actually, the budget appeared to be realistic in past years, and so far you have always been able to achieve an acceptable budget realization. The materiality-level used at this client is 10% of profits and thus has been €140.000 in 2015.

Audit 2015

Today is January 15th 2016. In your current function as auditor, you are auditing Seret Sport's debtors, and on January 22nd, you need to publish your audit report. The total accounts receivable balance on December 31st 2015 was €10.9 million, and €10.1 in 2014. This is an increase of 7.9%. Revenue grew by 2.9% in the same period. In past years, accounts receivable and revenue grew proportionally. Seret Sport's CFO states that a few large debtors have delayed payment, which is why the accounts receivable balance is higher this year than it has been in the past.

Seret Sport's reported accounts receivable on December 31st 2015 is €728,000 and thus higher than last year (€716,000). When checking the individual debtor positions and loan loss provisions, you identify two significant outstanding positions with a total of €540,000 that are not included in Seret Sport's accounts receivable. The positions are related to two debtors' sales invoices, Jonker Sport and Koraal Sport. On December 31st 2015, the claims and corresponding due dates are older than three months. Beneath you find Seret Sport's debtors list per December 31st 2015.

Debtor Number	Name	Invoice Number	Invoice Date	Due Date	Incl. VAT
2466	Berlage Sport	120921	30-10-15	29-11-15	€ 80,000
5649	China TC	121114	12-12-15	11-1-16	€ 2,130,000
4561	China TC	121078	26-11-15	25-12-15	€ 520,000
7950	Dennema Sport	120902	17-10-15	16-11-15	€ 130,000
3295	Enkevoort bv	120837	5-10-15	4-11-15	€ 150,000
3482	Evertse Sport bv	120785	24-9-15	23-10-15	€ 60,000
5369	Hall International	121140	18-12-15	17-1-16	€ 1,430,000
9274	Jonker Sport	120689	20-8-15	19-9-15	€ 230,000
3392	Kolding Import	121080	4-12-15	3-1-16	€ 400,000
1167	Koraal Sport	120701	8-8-15	7-9-15	€ 310,000
5683	Noorderlicht	121142	18-12-15	17-1-16	€ 430,000
5792	Pelham Holding	121153	21-12-15	20-1-16	€ 950,000
6241	Pelham Holding	121166	28-12-15	27-1-16	€ 420,000
5543	Snowsport Int.	120964	2-11-15	1-12-15	€ 30,000
6787	Tervliet BV	121129	17-12-15	16-1-16	€ 290,000
3168	Tervliet BV	121009	16-11-15	15-12-15	€ 180,000
9657	Wintels	121121	14-12-15	13-1-16	€ 90,000
6345	W&V Intersport	121033	19-11-15	18-12-15	€ 760,000
3879	W&V Intersport	121106	11-12-15	10-1-16	€ 1,680,000
6503	Zwaag Holding	121102	10-12-15	9-1-16	€ 70,000

Smaller debtor positions (below €20,000) are not included in this list. The sum of these smaller debtors is €535,000 (per December 31st 2015).

Instructions

In your role as an auditor, you are asking your client about the valuation of the two outstanding positions. Seret Sport's CFO states that he has investigated reasons for the delay in payment for both debtors, and he is confident that each debtor will meet his obligation. He documented his investigation. The CFO states that he does not perceive the possibility of the open positions turning into bad debt, and thus, the two positions were not included in the accounts receivable per December 31st 2015.

(Participants then logged on to the MouselabWEB environment to acquire additional information and to indicate their judgment. For more information, see below)

INSTRUCTIONS FOR RETRIEVING INFORMATION

Instructions (Part 1 of 2)

To continue the experiment, you can access more information on Seret Sport and its debtors. The information is presented in several boxes. Each box is labeled.

To access the information in a box, click on it once. If you want to open another box, click the open box again (to close it), then click on the next box you would like to open. Try it here:



Example of practice boxes displayed to participants

Instructions (Part 2 of 2)

On the following page, you will find additional information on Seret Sport and the two debtors Jonker Sport and Koraal Sport. You can access as much information as you find necessary to make a judgment.

Remember that time you spend on accessing information is deducted from your budget!

Moreover, you can make the following assumptions:

- 1) You are checking the valuation, not the existence of the open positions. Sufficient evidence has previously been collected to give you certainty that the debtors exist.
- 2) Delaying the audit report is not an option. You need to decide based on the information given.
- 3) The information in the experiment is all the information that is available to you as an auditor.
- 4) The delays in payment are not due to claims on product quality on Seret Sport. There are thus no quality or delivery issues.

Please note that you cannot navigate backwards between screens. This is part of the experiment and the same for all participants

INFORMATION ITEMS PRESENTED TO PARTICIPANTS

These are the information boxes you can click to open and close. You may need to scroll / zoom, depending on your screen.

When you are ready to make a judgment, go to the next page. Remember, you cannot come back to this screen.

Results CFO's Analysis of Outstanding Positions	CFO's Underlying Documentation	Sector Analysis Sports Industry (HBD)
Payment History Jonker Sport	Payment History Koraal Sport	List of Accounts Payable per December 31 st 2015
Balance Sheet Jonker Sport	Balance Sheet Koraal Sport	Chamber of Commerce Entries Jonker & Koraal
Profit and Loss Statement Jonker Sport	Profit and Loss Statement Koraal Sport	Payment History Other Debtors
Cash Flow Statement Jonker Sport	Cash Flow Statement Koraal Sport	Goods Issue Vouchers Deliveries J & K
Press Release Jonker Sport	Press Release Koraal Sport	Bank Statements Seret Sport January 2016
Original Invoice Jonker Sport	Original Invoice Koraal Sport	

In the original environment, all boxes were equally shaded. In this illustration, the darker the shade, the more relevant the information item to the judgment to be made.

Item 1: Results CFO's Analysis of Outstanding Positions

Positions outstanding >90 days		Supporting Argumentation
Jonker Sport	€ 230.000	Seret Sport's CFO contacted Jonker Sport. Jonker's CFO indicated via phone that payment will be made soon. At Jonker, the invoice had been overlooked.
Koraal Sport	€ 310.000	Seret Sport's CFO assures that Koraal is a larger, credit-worthy company, so no liquidity risk is assumed, hence no reason to assume that Koraal will not pay.

Item 2: CFO's Underlying Documentation

You analyze your client's substantiation by accessing Seret Sport CFO's collected evidence. You are retrieving internal memos and communication.

Looking at evidence on Jonker Sport, you find an internal memo written by Seret Sport's financial director about the telephone call with Jonker Sport's CFO. You establish that Seret Sport's financial director has sent a copy of the memo via email to Seret Sport's debtor administration

Looking at evidence on Koraal Sport, you find that Seret Sport's financial director has accessed Koraal Sport's website. He has documented information on Koraal Sport's company profile and published (summary) financial information.

Item 3: Sector Analysis Sports Industry (HBD)

Yesterday's consumer will not exist tomorrow

The sports industry has changed and will keep on changing in the upcoming 5 years. More people than ever actively do sports, of all ages and classes. The ageing of the Dutch population has made fitness, aerobics, cycling, hiking and running even more popular in the future.

The industry's structure is changing and will keep on changing

Consumers are doing more sports than ever. The number and size of shops is increasing, increasing employment. Still, the market volume remains

stable at €1.4 billion, resulting from falling prices and increasing trade volume. Large chains and superstores dominate the market. The internet's market share currently lies at 5%, possibly rising to 15-20%.

Item 4: Payment History Jonker Sport

You perform further analysis, accessing Jonker Sport's payment history with Seret Sport.

	Applicable Payment Term Jonker Sport
2012	33 days on average
2013	35 days on average
2014	37 days on average
Outstanding position per December 31st 2015	132 days

Moreover, you determine that Seret Sport conducts 3 to 4 deliveries per year to Jonker Sport. No further transactions have taken place since the last invoice has not been paid.

Item 5: Payment History Koraal Sport

You perform further analysis, accessing Koraal Sport's payment history with Seret Sport.

	Applicable Payment Term Jonker Sport
2012	78 days on average
2013	97 days on average
2014	96 days on average
Outstanding position per December 31st 2015	144 days

Moreover, you determine that Seret Sport conducts 3 to 4 deliveries per year to Koraal Sport. No further transactions have taken place since the last invoice has not been paid.

Item 6: List of Accounts Payables per December 31st 2015

Client Number	Name	Location	Amount
3463	Belastingdienst	Utrecht	€ 756.000
3247	Bloemers en Verhoeff	Alphen a/d Rijn	€ 72.000
8932	CMS Holding	Amsterdam	€ 1.808.000
6756	Drummen bv	Renkum	€ 12.000
6298	Gerol Finance B.V.	Nijmegen	€ 154.000
3480	ING Bank	Utrecht	€ 97.000
2365	KPN	Den Haag	€ 36.000
6876	Kuipers	Winschoten	€ 420.000
7867	Meso SpA	Milaan	€ 1.274.000
5982	Overdijk	Amsterdam	€ 587.000
8792	Oldewater BV	Utrecht	€ 159.000
8345	Prosman GmbH	Duisburg	€ 2.690.000
3249	Roelofsz	Zeist	€ 16.000
6780	Tespi International	Rotterdam	€ 856.000
7564	Tianjin Holding	Beijing	€ 2.213.000

Smaller creditors (below €10,000) are not included in this list. The total amount of these smaller creditors is €304,000.

Item 7: Balance Sheet Jonker Sport

Assets (x€1000)		Liabilities (x€1000)	
Tangible fixed assets	8400	Share capital	3100
Intangible fixed assets	500	Retained earnings	1400
		Total Equity	4500
Inventories	4400		
Accounts Receivable	4200	Long-term Liabilities	7800
Allowance for bad debts	200	Provisions	900
		Accounts Payable	4800
Cash	300	Total liabilities	13500
Total Assets	18000	Total Equity & Liabilities	18000

Item 8: Balance Sheet Koraal Sport

Assets (x€1000)		Liabilities (x€1000)	
Buildings	3800	Share capital	2000
Equipment	1200	Retained earnings	3700
		Total Equity	5700
Inventories	3000		
Accounts Receivable	1600	Long-term Liabilities	2800
		Provisions	400
		Accounts Payable	1700
Bank	1000	Total liabilities	4900
Total Assets	10600	Total Equity & Liabilities	10600

Item 9: Chamber of Commerce Entries Jonker Sport & Koraal Sport

You access entries of both debtors at the Chamber of Commerce. You determine that both debtors are registered with the Chamber of Commerce, under the names known to Seret Sport.

Item 10: Profit and Loss Statement Jonker Sport

	(x€1000)	(x€1000)
Net Revenue	45000	
Total operating income		45000
Cost of goods sold	39500	
Wages and salaries	3000	
Other operating expenses	1800	
Total operating expenses		44300
Operating Income		700
Taxes		200
Profit after taxes		500

Item 11: Profit and Loss Statement Koraal Sport

	(x€1000)	(x€1000)
Net Revenue	32000	
Total operating income		32000
Cost of goods sold	23000	
Wages and salaries	4500	
Other operating expenses	3200	
Total operating expenses		30700
Operating Income		1300
Taxes		400
Profit after taxes		900

Item 12: Payment History Other Debtors

Debtor	Name	Location	Payment Term (in days)			
			2012	2013	2014	2015
2466	Berlage Sport	Veendam		33	35	38
5649	China TC	Rotterdam	22	22	26	23
7950	Dennema Sport	Groningen			35	42
3295	Enkevoort bv	Maastricht				18
3482	Evertse Sport bv	Utrecht	49	63	48	55
5369	Hall International	Amsterdam	29	28	30	29
3392	Kolding Import	Kolding (dk)		47	43	38
5683	Noorderlicht	Amstelveen				32
5792	Pelham Holding	London	26	26	28	29
5543	Snowsport Int.	Utrecht		29	28	30
6787	Tervliet BV	Rotterdam	40	56	38	41
9657	Wintels	Enschede			25	35
3879	W&V Intersport	Nieuwegein	72	72	74	75
6503	Zwaag Holding	Almere	28	25	29	26

Item 13: Cash Flow Statement Jonker Sport

	(x€1000)
Profits after taxes	500
Depreciation	300
Provisions	-150
Change in Working capital	-350
Cash flow from operating activities	300
Cash flow from investing activities	-600
Cash flow from financing activities	-200
Net cash flow	-500

Item 14: Cash Flow Statement Koraal Sport

	(x€1000)
Profits after taxes	900
Depreciation	300
Provisions	50
Change in Working capital	150
Cash flow from operating activities	1400
Cash flow from investing activities	-300
Cash flow from financing activities	-100
Net cash flow	1000

Item 15: Goods Issue Vouchers Deliveries Jonker and Koraal Sport

You retrieve the goods issue vouchers of the deliveries to Jonker Sport and Koraal Sport. You observe that the goods were indeed delivered to both debtors in question.

*Item 16: Press Release Jonker Sport***New Website Jonker Sport**

Jonker Sport, the largest online sports shop of the Netherlands, introduced its new website. Since 2005, Jonker Sport has been selling more than 4000 sports articles from several brands online. New B2C-features were introduced to increase intuitive navigation, including high-resolution product pictures.

Jonker Sports is planning to introduce its online shop across Europe. Currently, the web shop is available in Dutch, English, German and Italian. Dennis van der Made, CEO: "Collaborating with full-service partner Softlution and the new online platform make it possible for us to conquer Europe."

*Item 17: Press Release Koraal Sport***Koraal Sport and Ski-Chalets to collaborate**

Ski-Chalet will collaborate with Koraal Sport, a sport equipment seller with several mega stores. Both parties will promote different deals and special offers, from skiing suits to free winter sports holidays. The first special offer is part the Ski&Snowboard event in Koraal's superstore in Rotterdam, on November 26, 27 and 28 November, a large event with spectacular offers, info stands, and the complete new winter collection skis, snowboards and winter sport locations, all on sale.

Item 18: Bank Statements Seret Sport January 2016 with Received Payments by Debtors

You retrieve a list of bank statements including the payments by your client's debtors. Based on this list you find that both debtors in question have not yet paid.

Item 19: Original Invoice Jonker Sport

Invoice Seret ^{Sport}		To	Jonker Sport Industriestraat 2 Schiedam
Invoice nr.	1252879		
Client nr.	4541	Date	20 August 2015
VAT nr.	87463567	Expiry Date	19 September 2015
	Description	Volume	Total
	Sports Articles	2420	€ 193.872
		Total Excl.	€ 193.872
		VAT	€ 36.723
		Payable	€ 230.000
Please transfer within 30 days to bank account 41.35.03.53, ANBank referencing the invoice number			

Item 20: Original Invoice Koraal Sport

Invoice Seret ^{Sport}		To	Koraal Sport Utrechtseweg 10 Utrecht
Invoice nr.	1259113		
Client nr.	6208	Date	8 August 2015
VAT nr.	63920910	Expiry Date	7 September 2015
	Description	Volume	Total
	Sports Articles	2980	€ 260.504
		Total Excl.	€ 260.504
		VAT	€ 49.496
		Payable	€ 310.000
Please transfer within 30 days to bank account 41.35.03.53, ANBank referencing the invoice number			

Question: Would you have liked to access additional information? If so, which kind?

YOUR JUDGMENT

Please respond to the following questions:

	Jonker Sport	Koraal Sport
How likely do you think (Jonker / Koraal) is going to pay?	%	%
On which information do you base this judgment?	text	text
How certain are you that your judgment of (Jonker / Koraal) is accurate, based on the information you have accessed?	%	%

Final Decision

Will you ask your client to adjust their provision for loan losses? (yes / no)

On which information do you base this decision? (text)

How certain are you that your decision is accurate, based on the information you have accessed? (in percent)

Final Questions

Have you previously executed a control of a client's accounts receivable? (yes / no)

Do you find the case realistic? (1-5, not realistic at all - very realistic)

Do you think that the task in the case a routine task? (1-5, not a routine task at all - very much a routine task)

What is your usual role in auditing a client's accounts receivable? (assisting, executing, supervising, not applicable)

You have completed the case. Please continue to the questionnaire by clicking on the following link: (link to questionnaire, see below).

APPENDIX II

QUESTIONNAIRE USED IN PART I

INSTRUCTIONS FOR PARTICIPANTS

Dear participant,

This questionnaire is part of a joint research project of (institution name) and (company name) that investigates the importance of learning climate and learning activities for auditor performance.

The input of this questionnaire will be treated confidentially and results will only be presented at an aggregate level, individual responses will not be identifiable.

Filling in this questionnaire will take about 15 minutes. Thank you in advance for your cooperation. If you have any questions, please contact ...

Kind regards, ...

QUESTIONNAIRE SCALES & ITEMS

Demographics & Amount of Experience

- Please indicate your gender (male/female)
- How many years have you been working as a certified accountant? (in years)
- How many years have you been performing audit tasks? (in years)
- How many years have you been working for your current employer? (in years)
- What is your function level? (text)

Mechanisms of Learning from Experience

Critical Incidents

Think about the three clients you spend most of your time with, did any of them exhibit surprising behavior in the past three years? (3x yes/no)

Learning Climate (Inquiry & Dialogue Scale, Marsick & Watkins, 2003)
(1-6 Likert scale, almost never – almost always)

- In my organization, people give open and honest feedback to each other
- In my organization, people listen to others' views before speaking
- In my organization, people are encouraged to ask 'why' regardless of rank
- In my organization, whenever people state their view, they also ask what others think
- In my organization, people treat each other with respect
- In my organization, people spent time building trust with each other

Feedback Value (Ashford, 1986)

(1-5 Likert scale, strongly disagree, strongly agree)

- It is important to me to receive feedback on my performance.
- I would like to get more feedback on what behaviors will help me do better in performing my job.
- I find feedback on my performance useful.
- It is important for me to receive feedback on my potential for advancement within auditing.
- I would like to get more feedback on what behaviors will help me advance within the company.
- I find feedback on my advancement potential useful.

Feedback Amount (Ashford, 1986)

(1-4 Likert scale, a lot, some, a little, none)

How much feedback information have you received recently from the following sources:

- from your boss
- from your co-workers
- from your own thoughts and feelings
- from the task itself
- from friends outside the organization and/or your spouse

Meta-Cognition (Cognitive Self-Consciousness Scale, Cartwright-Hatton & Wells, 1997)

(1-5 Likert scale, strongly disagree – strongly agree)

- I think a lot about my thoughts
- I am aware of the way my mind works when I am thinking through a problem
- I monitor my thoughts
- I rarely question my thoughts (R)
- I am constantly aware of my thinking
- I pay close attention to the way my mind works
- I constantly examine my thoughts

Professional Skepticism (Hurt, 2010)

(1-6 Likert scale, strongly disagree – strongly agree)

Questioning Mind

- My friends tell me that I often question things that I see or hear.
- I usually notice inconsistencies in explanations.
- I often reject statements unless I have proof that they are true.
- I enjoy trying to determine if what I read or hear is true.

Suspension of Judgment

- I take my time when making decisions.
- I dislike having to make decisions quickly.
- I don't like to decide until I've looked at all of the readily available information.
- I like to ensure that I've considered most available information before making a decision.

Search for Knowledge

- I think that learning is exciting.
- The prospect of learning excites me.
- Discovering new information is fun.
- I like learning more about many situations.

Interpersonal Understanding

- I am interested in what causes people to behave the way that they do.
- I like to understand the reason for other people's behavior.
- I seldom consider why people behave in a certain way. (R)
- Other people's behavior doesn't interest me. (R)

Autonomy

- It is easy for other people to convince me. (R)
- I let what others say influence my decision making. (R)
- Most often I agree with what the others in my group think. (R)
- I usually I accept things I see, read, or hear at face value. (R)
- I tend to immediately accept what other people tell me. (R)

Self-Esteem

- I have confidence in myself.
- I feel good about myself.
- I am self-assured.
- I don't feel sure of myself. (R)

APPENDIX III

CASE TO MEASURE JUDGMENT QUALITY IN PART II

INSTRUCTIONS PROVIDED TO PARTICIPANTS

Start

You are about to read a description of your client Seret Sport. In your current function, you are involved in the control of the financial statements at the end of the financial year. After a general description of your client Seret Sport, you will find the need to make a decision similar to work with clients in your actual portfolio.

Please follow the directions on this paper and in the online environment. After working on the case study, we are asking you to fill in a questionnaire. Overall, we expect this task to take 30-35 minutes.

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t.grohnert@maastrichtuniversity.nl.

Thank you for your participation!

Kind regards,

Therese Grohnert, Roger Meuwissen & Wim Gijssels

CASE: SERET SPORT

Background

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Seret Sport is operating in a steadily growing market for high-quality sports equipment. Excellent knowledge of the market and the continuous search for innovative products has so far created a stable growth in revenue. Even though the market in which Seret Sport operates is becoming more and more competitive, the board feels that Seret Sport can continue to develop as they currently do. Indeed, the combination of a very competent purchasing and sales staff, a good reputation, the products' high quality and the good value for money of Seret Sport's products, the company has managed to keep its expected competitive advantage.

Your audit firm has been auditing Seret Sport's financial statements for the past four years and this year is hired again to perform the end of year audit of the financial statements. Your firm has a good and professional relationship with Seret Sport, and both the board and the employees of Seret Sport overall are cooperative with you. The company does not have an aggressive reputation with respect to earnings management. You as auditor have perceived the system of internal controls of Seret to be of high quality, and during previous audits, few audit differences were found. The audit environment at Seret Sport has always been rated as sufficient.

Also, you have a realistic audit budget. Actually, the budget appeared to be realistic in past years, and so far you have always been able to achieve an acceptable budget realization. The materiality-level used at this client is 10% of profits and thus has been €140.000 in 2015.

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Seret Sport's reported loan loss provisions on December 31st 2015 is €728,000 and thus higher than last year (€716,000). When checking the individual debtor positions and loan loss provisions, you identify three significant outstanding positions with a total of €540.000 that are not included in Seret Sport's loan loss provisions. The positions are related to three sales invoices to debtors Jonker Sport, Koraal Sport and Roover. On December 31st 2015, the claims and corresponding due dates are older than three months. Beneath you find Seret Sport's debtors list per December 31st 2015.

Debtor Number	Name	Invoice Number	Invoice Date	Due Date	Incl. VAT
2466	Berlage Sport	120921	30-10-15	29-11-15	€ 80,000
5649	China TC	121114	12-12-15	11-1-16	€ 2,130,000
4561	China TC	121078	26-11-15	25-12-15	€ 520,000
7950	Dennema Sport	120902	17-10-15	16-11-15	€ 130,000
3295	Enkevoort bv	120837	5-10-15	4-11-15	€ 150,000
3482	Evertse Sport bv	120785	24-9-15	23-10-15	€ 60,000
5369	Hall International	121140	18-12-15	17-1-16	€ 1,430,000
9274	Jonker Sport	120689	20-8-15	19-9-15	€ 230,000
3392	Kolding Import	121080	4-12-15	3-1-16	€ 400,000
1167	Koraal Sport	120701	8-8-15	7-9-15	€ 310,000
5683	Noorderlicht	121142	18-12-15	17-1-16	€ 430,000
5792	Pelham Holding	121153	21-12-15	20-1-16	€ 950,000
6241	Pelham Holding	121166	28-12-15	27-1-16	€ 420,000
5543	Snowsport Int.	120964	2-11-15	1-12-15	€ 30,000
4120	Roover	120728	27-8-15	26-9-15	€ 245,000
6787	Tervliet BV	121129	17-12-15	16-1-16	€ 290,000
3168	Tervliet BV	121009	16-11-15	15-12-15	€ 180,000
9657	Wintels	121121	14-12-15	13-1-16	€ 90,000
6345	W&V Intersport	121033	19-11-15	18-12-15	€ 760,000
3879	W&V Intersport	121106	11-12-15	10-1-16	€ 1,680,000
6503	Zwaag Holding	121102	10-12-15	9-1-16	€ 70,000

Smaller debtor positions (below €20,000) are not included in this list. The sum of these smaller debtors is €535,000 (per December 31st 2015).

In your role as an auditor, you are asking your client about the valuation of the three outstanding positions. Seret Sport's CFO states that he has investigated reasons for the delay in payment for each of the three debtors, and he is confident that each debtor will meet his obligation. He documented his investigation. The CFO states that he does not perceive the possibility of the open positions turning into bad debt, and thus were the three positions not included in the loan loss provisions per December 31st 2015.

(Participants then logged on to the MouselabWEB environment to acquire additional information and to indicate their judgment. For more information, see below)

INSTRUCTIONS FOR RETRIEVING INFORMATION

Instructions (Part 1 of 2)

To continue the experiment, you can access more information on Seret Sport and its debtors. The information is presented in several boxes. Each box is labeled.

To access the information in a box, click on it once. If you want to open another box, click the open box again (to close it), then click on the next box you would like to open. Try it here:



Example of practice boxes displayed to participants

Instructions (Part 2 of 2)

On the following page, you will find additional information on Seret Sport and the two debtors Jonker Sport and Koraal Sport. You can access as much information as you find necessary to make a judgment.

Remember that time you spend on accessing information is deducted from your budget!

Moreover, you can make the following assumptions:

- 1) You are checking the valuation, not the existence of the open positions. Sufficient evidence has previously been collected to give you certainty that the debtors exist.
- 2) Delaying the audit report is not an option. You need to decide based on the information given.
- 3) The information in the experiment is all the information that is available to you as an auditor.
- 4) The delays in payment are not due to claims on product quality on Seret Sport. There are thus no quality or delivery issues.

Please note that you cannot navigate backwards between screens. This is part of the experiment and the same for all participants

Information Items Presented to Participants

These are the information boxes you can click to open and close. You may need to scroll / zoom, depending on your screen.

When you are ready to make a judgment, go to the next page. Remember, you cannot come back to this screen.

Results CFO's Analysis of Outstanding Positions	Underlying Documentation Jonker Sport	Underlying Documentation Koraal Sport	Underlying Documentation Roover Sport
Payment History Jonker Sport	Payment History Koraal Sport	Payment History Roover Sport	Sector Analysis Sports Industry (HBD)
Balance Sheet Jonker Sport	Balance Sheet Koraal Sport	Balance Sheet Roover Sport	List of Accounts Payable per December 31 st 2015
Profit and Loss Jonker Sport	Profit and Loss Koraal Sport	Profit and Loss Roover Sport	Chamber of Commerce Entries Jonker & Koraal
Cash Flow Jonker Sport	Cash Flow Koraal Sport	Cash Flow Roover Sport	Payment History Other Debtors
Press Release Jonker Sport	Press Release Koraal Sport	Press Release Roover Sport	Goods Issue Vouchers Deliveries J & K
Original Invoice Jonker Sport	Original Invoice Koraal Sport	Original Invoice Roover Sport	Bank Statements Seret Sport January 2016

In the original environment, all boxes were equally shaded. In this illustration, the darker the shade, the more relevant the information item to the judgment to be made.

Item 1: Results CFO's Analysis of Outstanding Positions

Positions outstanding >90 days		Supporting Argumentation
Jonker Sport	€ 230.000	Seret Sport's CFO contacted Jonker Sport. Jonker's CFO indicated via phone that payment will be made soon. At Jonker, the invoice had been overlooked.
Koraal Sport	€ 310.000	Seret Sport's CFO assures that Koraal is a larger, credit-worthy company, so no liquidity risk is assumed, hence no reason to assume that Koraal will not pay.
Roover	€245,000	Seret Sport's CFO contacted Roover. The CEO indicates that the invoice will be paid. Due to high work pressure and a new bookkeeper, the invoice has not been processed yet.

Item 2: CFO's Underlying Documentation for Jonker Sport

You analyze your client's substantiation by accessing Seret Sport CFO's collected evidence. You are retrieving internal memos and communication.

Looking at evidence on Jonker Sport, you find an internal memo written by Seret Sport's financial director about the telephone call with Jonker Sport's CFO. You establish that Seret Sport's financial director has sent a copy of the memo via email to Seret Sport's debtor administration

Item 3: CFO's Underlying Documentation for Koraal Sport

You analyze your client's substantiation by accessing Seret Sport CFO's collected evidence. You are retrieving internal memos and communication.

Looking at evidence on Koraal Sport, you find that Seret Sport's financial director has accessed Koraal Sport's website. He has documented information on Koraal Sport's company profile and published (summary) financial information.

Item 4: CFO's Underlying Documentation for Roover Sport

You analyze your client's substantiation by accessing Seret Sport CFO's collected evidence. You are retrieving internal memos and communication.

Looking at evidence on Roover, you find that Seret Sport's financial director has sent an email request to Roover's CFO, and that he saved Roover CFO's response. Moreover, you find that Seret Sport's financial director has sent a copy of the email response to Seret Sport's debtor administration.

Item 5: Payment History Jonker Sport

You perform further analysis, accessing Jonker Sport's payment history with Seret Sport.

	Applicable Payment Term Jonker Sport
2012	33 days on average
2013	35 days on average
2014	37 days on average
Outstanding position per December 31st 2015	132 days

Moreover, you determine that Seret Sport conducts 3 to 4 deliveries per year to Jonker Sport. No further transactions have taken place since the last invoice has not been paid.

Item 6: Payment History Koraal Sport

You perform further analysis, accessing Koraal Sport's payment history with Seret Sport.

	Applicable Payment Term Jonker Sport
2012	78 days on average
2013	97 days on average
2014	96 days on average
Outstanding position per December 31st 2015	144 days

Moreover, you determine that Seret Sport conducts 3 to 4 deliveries per year to Koraal Sport. No further transactions have taken place since the last invoice has not been paid.

Item 7: Payment History Roover Sport

You perform further analysis, accessing Roover Sport's payment history with Seret Sport.

	Applicable Payment Term Jonker Sport
2012	38 days on average
2013	46 days on average
2014	47 days on average
Outstanding position per December 31st 2015	125 days

Moreover, you determine that Seret Sport conducts 3 to 4 deliveries per year to Roover Sport. No further transactions have taken place since the last invoice has not been paid.

*Item 8: Sector Analysis Sports Industry (HBD)**Yesterday's consumer will not exist tomorrow*

The sports industry has changed and will keep on changing in the upcoming 5 years. More people than ever actively do sports, of all ages and classes. The ageing of the Dutch population has made fitness, aerobics, cycling, hiking and running even more popular in the future.

The industry's structure is changing and will keep on changing

Consumers are doing more sports than ever. The number and size of shops is increasing, increasing employment. Still, the market volume remains stable at €1.4 billion, resulting from falling prices and increasing trade volume. Large chains and superstores dominate the market. The internet's market share currently lies at 5%, possibly rising to 15-20%.

Item 7: Balance Sheet Jonker Sport

Assets (x€1000)		Liabilities (x€1000)	
Tangible fixed assets	8400	Share capital	3100
Intangible fixed assets	500	Retained earnings	1400
		Total Equity	4500
Inventories	4400		
Accounts Receivable	4200	Long-term Liabilities	7800
Allowance for bad debts	200	Provisions	900
		Accounts Payable	4800
Cash	300	Total liabilities	13500
Total Assets	18000	Total Equity & Liabilities	18000

Item 8: Balance Sheet Koraal Sport

Assets (x€1000)		Liabilities (x€1000)	
Buildings	3800	Share capital	2000
Equipment	1200	Retained earnings	3700
		Total Equity	5700
Inventories	3000		
Accounts Receivable	1600	Long-term Liabilities	2800
		Provisions	400
		Accounts Payable	1700
Bank	1000	Total liabilities	4900
<hr/>		<hr/>	
Total Assets	10600	Total Equity & Liabilities	10600

Item 9: Balance Sheet Roover Sport

Assets (x€1000)		Liabilities (x€1000)	
Tangible fixed assets	6200	Share capital	3100
Intangible fixed assets	700	Retained earnings	1400
		Total Equity	4500
Inventories	3400		
Accounts Receivable	2900	Long-term Liabilities	5300
Allowance for bad debts	300	Provisions	900
		Accounts Payable	3300
Cash	500	Total liabilities	9500
<hr/>		<hr/>	
Total Assets	14000	Total Equity & Liabilities	14000

Item 10: List of Accounts Payables per December 31st 2015

Client Number	Name	Location	Amount
3463	Belastingdienst	Utrecht	€ 756.000
3247	Bloemers en Verhoeff	Alphen a/d Rijn	€ 72.000
8932	CMS Holding	Amsterdam	€ 1.808.000
6756	Drummen bv	Renkum	€ 12.000
6298	Gerol Finance B.V.	Nijmegen	€ 154.000
3480	ING Bank	Utrecht	€ 97.000
2365	KPN	Den Haag	€ 36.000
6876	Kuipers	Winschoten	€ 420.000
7867	Meso SpA	Milaan	€ 1.274.000
5982	Overdijk	Amsterdam	€ 587.000
8792	Oldewater BV	Utrecht	€ 159.000
8345	Prosman GmbH	Duisburg	€ 2.690.000
3249	Roelofsz	Zeist	€ 16.000
6780	Tespi International	Rotterdam	€ 856.000
7564	Tianjin Holding	Beijing	€ 2.213.000

Smaller creditors (below €10,000) are not included in this list. The total amount of these smaller creditors is €304,000.

Item 11: Profit and Loss Statement Jonker Sport

	(x€1000)	(x€1000)
Net Revenue	45000	
Total operating income		45000
Cost of goods sold	39500	
Wages and salaries	3000	
Other operating expenses	1800	
Total operating expenses		44300
Operating Income		700
Taxes		200
Profit after taxes		500

Item 12: Profit and Loss Statement Koraal Sport

	(x€1000)	(x€1000)
Net Revenue	32000	
Total operating income		32000
Cost of goods sold	23000	
Wages and salaries	4500	
Other operating expenses	3200	
Total operating expenses		30700
Operating Income		1300
Taxes		400
Profit after taxes		900

Item 13: Profit and Loss Statement Roover Sport

	(x€1000)	(x€1000)
Net Revenue	36000	
Total operating income		36000
Cost of goods sold	30200	
Wages and salaries	3000	
Other operating expenses	1700	
Total operating expenses		34900
Operating Income		1100
Taxes		400
Profits after taxes		700

Item 14: Chamber of Commerce Entries Jonker Sport & Koraal Sport

You access entries of both debtors at the Chamber of Commerce. You determine that both debtors are registered with the Chamber of Commerce, under the names known to Seret Sport.

Item 15: Cash Flow Statement Jonker Sport

	(x€1000)
Profits after taxes	500
Depreciation	300
Provisions	-150
Change in Working capital	-350
Cash flow from operating activities	300
Cash flow from investing activities	-600
Cash flow from financing activities	-200
Net cash flow	-500

Item 16: Cash Flow Statement Koraal Sport

	(x€1000)
Profits after taxes	900
Depreciation	300
Provisions	50
Change in Working capital	150
Cash flow from operating activities	1400
Cash flow from investing activities	-300
Cash flow from financing activities	-100
Net cash flow	1000

Item 17: Cash Flow Statement Roover Sport

	(x€1000)
Profits after taxes	700
Depreciation	250
Provisions	-150
Change in Working capital	-400
Cash flow from operating activities	400
Cash flow from investing activities	-300
Cash flow from financing activities	-300
Net cash flow	-200

Item 18: Payment History Other Debtors

Debtor	Name	Location	Payment Term (in days)			
			2012	2013	2014	2015
2466	Berlage Sport	Veendam		33	35	38
5649	China TC	Rotterdam	22	22	26	23
7950	Dennema Sport	Groningen			35	42
3295	Enkevoort bv	Maastricht				18
3482	Evertse Sport bv	Utrecht	49	63	48	55
5369	Hall International	Amsterdam	29	28	30	29
3392	Kolding Import	Kolding (dk)		47	43	38
5683	Noorderlicht	Amstelveen				32
5792	Pelham Holding	London	26	26	28	29
5543	Snowsport Int.	Utrecht		29	28	30
6787	Tervliet BV	Rotterdam	40	56	38	41
9657	Wintels	Enschede			25	35
3879	W&V Intersport	Nieuwegein	72	72	74	75
6503	Zwaag Holding	Almere	28	25	29	26

Item 19: Press Release Jonker Sport

New Website Jonker Sport

Jonker Sport, the largest online sports shop of the Netherlands, introduced its new website. Since 2005, Jonker Sport has been selling more than 4000 sports articles from several brands online. New B2C-features were introduced to increase intuitive navigation, including high-resolution product pictures.

Jonker Sports is planning to introduce its online shop across Europe. Currently, the web shop is available in Dutch, English, German and Italian. Dennis van der Made, CEO: "Collaborating with full-service partner Softlution and the new online platform make it possible for us to conquer Europe."

Item 20: Press Release Koraal Sport

Koraal Sport and Ski-Chalets to collaborate

Ski-Chalet will collaborate with Koraal Sport, a sport equipment seller with several mega stores. Both parties will promote different deals and special offers, from skiing suits to free winter sports holidays. The first special offer is part the Ski&Snowboard event in Koraal's superstore in Rotterdam, on November 26, 27 and 28 November, a large event with spectacular offers, info stands, and the complete new winter collection skis, snowboards and winter sport locations, all on sale.

Item 21: Press Release Roover Sport

Roover Main Sponsor of Heerlen Half-Marathon

Roover has recently signed a three-year contract with the organizers of Heerlen's half-marathon. The Heerlen half-marathon is one of the oldest half-marathons in the Netherlands, in which over 5000 participants from the Euregio participate every year. Roover offers a full palette of running gear, making them the ideal partner for the Heerlen Half Marathon, taking place

on March 25th this year. The organizers are currently negotiating with a few top runners to join local participants.

Item 22: Goods Issue Vouchers Deliveries Jonker and Koraal Sport

You retrieve the goods issue vouchers of the deliveries to Jonker Sport and Koraal Sport. You observe that the goods were indeed delivered to both debtors in question.

Item 23: Original Invoice Jonker Sport

Invoice Seret ^{Sport}		To	Jonker Sport Industriestraat 2 Schiedam
Invoice nr.	1252879		
Client nr.	4541	Date	20 August 2015
VAT nr.	87463567	Expiry Date	19 September 2015
	Description	Volume	Total
	Sports Articles	2420	€ 193.872
		Total Excl.	€ 193.872
		VAT	€ 36.723
		Payable	€ 230.000
Please transfer within 30 days to bank account 41.35.03.53, ANBank referencing the invoice number			

Item 24: Original Invoice Koraal Sport

Invoice Seret ^{Sport}		To	Koraal Sport Utrechtseweg 10 Utrecht
Invoice nr.	1259113		
Client nr.	6208	Date	8 August 2015
VAT nr.	63920910	Expiry Date	7 September 2015
	Description	Volume	Total
	Sports Articles	2980	€ 260.504
		Total Excl.	€ 260.504
		VAT	€ 49.496
		Payable	€ 310.000
Please transfer within 30 days to bank account 41.35.03.53, ANBank referencing the invoice number			

Item 25: Original Invoice Roover Sport

Invoice Seret ^{Sport}		To	Roover Heerlerbaan 390 Heerlen
Invoice nr.	1262956		
Client nr.	4210	Date	27 August 2015
VAT nr.	87463567	Expiry Date	26 September 2015
	Description	Volume	Total
	Sports Articles	2010	€ 193.872
		Total Excl.	€ 205.882
		VAT	€ 39.118
		Payable	€ 245.000
Please transfer within 30 days to bank account 41.35.03.53, ANBank referencing the invoice number			

Item 26: Bank Statements Seret Sport January 2016 with Received Payments by Debtors

You retrieve a list of bank statements including the payments by your client's debtors. Based on this list you find that both debtors in question have not yet paid.

Question: Would you have liked to access additional information? If so, which kind?

YOUR JUDGMENT

Please respond to the following questions:

	Jonker	Koraal	Roover
How likely do you think (debtor) is going to pay?	%	%	%
On which information do you base this judgment?	text	text	text
How certain are you that your judgment of (debtor) is accurate, based on the information you have accessed?	%	%	%

Final Decision

Will you ask your client to adjust their provision for loan losses? (yes / no)

On which information do you base this decision? (text)

How certain are you that your decision is accurate, based on the information you have accessed? (in percent)

(Having provided their judgments, participants were automatically split in two groups: accurate judgment vs. inaccurate judgment. Participants with accurate judgments advanced to the final questions (see below) and the questionnaire. Participants who made an inaccurate judgment advanced to the second phase of the experiment and were randomly assigned to one of three conditions, specified below. On the next page in the MouselabWEB

environment, participants saw the same information items as illustrated in the figure above. In addition, they find the following text and an additional item labeled 'Manager Advice'.)

ATTENTION!

Your manager performs a review of your audit activities and finds that you made a mistake when judging Seret Sport's loan losses provisions.

Your manager is giving you advice on how to improve your judgment. You can access it in the box 'Manager Advice' below.

Condition	'Manager Advice' provided to participants
Feedback Only	Your manager calls you and asks you to check the companies with outstanding positions again.
Feedback + Checklist	<p>Together with you, he runs through the client's file once more and gives you the following instructions:</p> <p>Examine and evaluate the client's analysis of the companies' likelihood of payment.</p> <p>Examine the financial information of each company with debt outstanding.</p> <p>Loop up additional information about companies with outstanding positions.</p> <p>Based on this information, you judge whether Seret Sport's allowance for bad debt is accurate.</p>
Feedback + Checklist + Reflection	<p>Together with you, he runs through the client's file once more and gives you the following instructions:</p> <p>Examine and evaluate the client's analysis of the companies' likelihood of payment.</p> <ul style="list-style-type: none"> - is each company's reply documented? - is the company response given by the correct person? <p>Examine the financial information of each company with debt outstanding.</p> <ul style="list-style-type: none"> - is each company's solvency, profit level and cash flow in line with common levels? <p>Loop up additional information about companies with outstanding positions.</p> <ul style="list-style-type: none"> - does the information in press statements or market sector reports confirm or contradict your current view of each company's likelihood of payment? <p>Based on this information, you judge whether Seret Sport's allowance for bad debt is accurate.</p>

(After accessing the manager advice, participants were free to access the information provided again in order to improve their judgment. After participants had completed their search, they advanced to the next screen.)

YOUR JUDGMENT

Please respond to the following questions:

	Jonker	Koraal	Roover
How likely do you think (debtor) is going to pay?	%	%	%
On which information do you base this judgment?	text	text	text
How certain are you that your judgment of (debtor) is accurate, based on the information you have accessed?	%	%	%

Final Decision

Will you ask your client to adjust their provision for loan losses? (yes / no)

On which information do you base this decision? (text)

How certain are you that your decision is accurate, based on the information you have accessed? (in percent)

Final Questions

Have you previously executed a control of a client's accounts receivable? (yes / no)

Do you find the case realistic? (1-5, not realistic at all - very realistic)

Do you think that the task in the case a routine task? (1-5, not a routine task at all - very much a routine task)

What is your usual role in auditing a client's accounts receivable? (assisting, executing, supervising, not applicable)

You have completed the case. Please continue to the questionnaire by clicking on the following link: (link to questionnaire, see below).

APPENDIX IV

QUESTIONNAIRE USED IN PART II

INSTRUCTIONS FOR PARTICIPANTS

Dear participant,

Thank you for participating in our study. The input of this questionnaire will be treated confidentially and results will only be presented on aggregate level, individual responses will not be identifiable.

Filling in the questionnaire will take ca. 15 minutes. Thank you in advance for your cooperation.

If you have any questions, please contact ...

Kind regards,

...

QUESTIONNAIRE SCALES & ITEMS

Help-Seeking Behavior and Network Characteristics (van der Rijt et al. 2013)

When you experience uncertainty, an error or mistake at work, whom do you typically turn to for help and advice? Please indicate the INITIALS or FIRST NAMES of the most relevant persons (up to 10 persons).

You will be asked questions about your relationship with these people, and the names you enter here are purely a memory aid for you - we, the research team, do not need to know who you are referring to.

- For each person you just named, please indicate their hierarchy level relative to yours. (lower level, same level, higher level, not in the same organization)
- How often do you work together with this person? ([almost] never, sometimes, quite often, very often)
- How often do you ask this person for help or advice? ([almost] never, less than once per month, several times per month, several times per week, once a day, several times a day)
- In how far does each person's help contribute to your development of knowledge and skills? (1 – does not contribute at all, 5 – contributes a lot).

Organizational learning from errors climate (Putz, Kluge and Schilling 2012)

Supervisor Behavior

- Our supervisor informs his/her employees about consequences that may result from errors in subsequent work processes.
- Employees can talk to our supervisor about things that went wrong frankly, without suspecting any negative consequences.
- When someone in our work group has made a mistake, our supervisor helps him/her to correct it.
- Our supervisor praises him/her employees when they share their experiences in dealing with errors.

Employee Behavior

- In our work group, employees call each other's attention to consequences errors can have on their work and the work results of co-workers.
- When someone in our work group makes a mistake, other co-workers will help him/her to fix it.
- In our work group, co-workers readily accept hints about how to avoid or correct errors.

Procedures and Tasks

- In our work group there are regular meetings during which employees can also share their experiences in handling mistakes.
- Employees in our work group are in a position to realize for themselves when they have done something wrong.
- In our work group, employees are trained about how to deal with stress and fear arising from errors at work.
- Employees in our work group know how to get the information they need to correct errors.

Principles and Values

- People in our organization value open discussions about things that have gone wrong in day-to-day work.
- People in our organization believe that errors at work can be a helpful part of the learning process.
- When something goes wrong in our organization, emphasis is put on determining the cause.
- Everybody in our organization is expected to consider what and how other co-workers can also learn from him/her mistakes.

Error Orientation Questionnaire (Rybowiak et al. 1999)

An error / mistake is commonly described as a deliberate action that unexpectedly fails to achieve one's own or one's organization's objective or goal. Please think about the errors that you have experienced since you started working as an accountant and respond to the following items.

Covering Up Errors

- Why mention a mistake when it isn't obvious?
- It is disadvantageous to make one's mistakes public
- I do not find it useful to discuss my mistakes
- It can be useful to cover up mistakes
- I would rather keep my mistakes to myself
- Employees who admit to their errors, make a big mistake

Learning from Errors

- Mistakes assist me to improve my work
- Mistakes provide useful information for me to carry out my work
- My mistakes help me to improve my work
- My mistakes have helped me to improve my work

Background Variables

- Since you started your work as an auditor, how many (small) errors have you made yourself?
- Please indicate your gender (male/female)
- How many months have you been performing audit tasks?
- Are you employed at a Big4 firm? (yes/no)

APPENDIX V

FEEDBACK PROVIDED TO PARTICIPANTS OF PART II

EXAMPLE OF FEEDBACK FOR PARTICIPANTS IN PART II

Participants of the studies in Part II could elect to receive feedback on their case performance and questionnaire scores in relation to other participants. Feedback was used as an incentive for honest participation while maintaining anonymity. Participants could choose to request feedback through the questionnaire and were asked to note the ID Number randomly assigned to them at the start of the data collection to collect their feedback later.

A few days after participants submitted their data, the feedback was sent to their instructors with the request to print out the two pages of feedback per participant and to allow participants to collect the pages with them.

The first part of the feedback graphically compared participants' scores to the mean scores of the entire sample and provided comments to help participants understand the concept measured as well as the relative meaning of their scores. Some basic findings from earlier studies were included to provide context.

The second part of the feedback provided participants with simplified information on their case performance. To this end, participants' behavior was coded as based on relevant evidence vs. not based on relevant evidence (derived from the MouselabWEB data), and their judgments were coded as either accurate or inaccurate. These codes were assigned to participants for both phases of the experiment, showing them whether their judgment quality improved. Comments were added to explain the rationale behind the scores. Moreover, judgment quality was related to participants' self-reported confidence, indicating whether their confidence (mis-)matched performance.

An example of feedback provided to one participant is included in the following two pages.

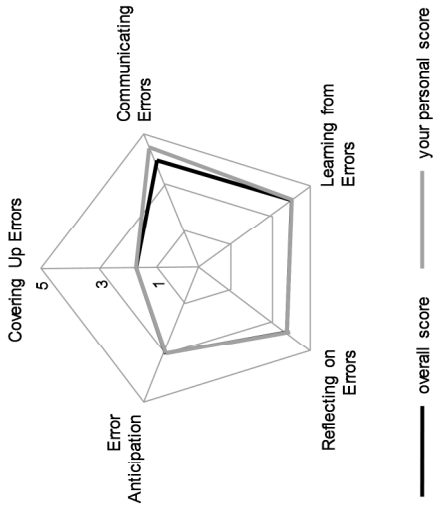
YOUR PERSONALIZED FEEDBACK | ID 154

Thank you again for your participation in last week's experiment on the role of learning from daily experience for constructively handling audit errors. This feedback sheet gives you an overview of your scores relative to those of all other participants. We included small comments on what we have learned from research so far to support you in your further development.

1. YOUR ERROR ORIENTATION

This factor measures your attitude towards handling errors in the workplace. This attitude can reflect both your personality and the environment at your firm.

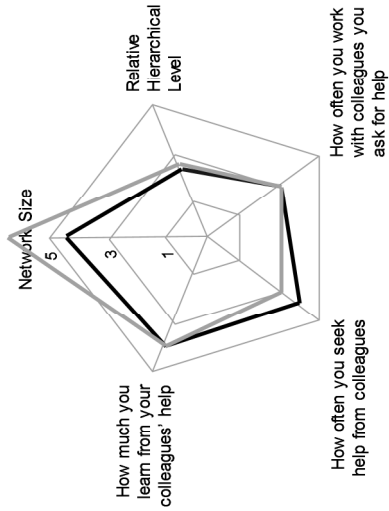
- Your scores on the different scales of error orientation are very similar to those of the other participants.
- In past research we have found that especially a negative attitude towards covering up, and positive attitudes on communicating, learning and reflecting errors are connected to actual learning from errors and improving performance over time.
- We find that participants were least likely to cover up an error when they feel that their managers and colleagues encourage them to learn from errors and when they can easily communicate errors with colleagues in the firm.



YOUR PERSONALIZED FEEDBACK | ID 154

2. YOUR HELP NETWORK

This factor measures who you turn to for help and why. It is a measure of how much learning behavior you show after experiencing a (potential) error.



- You indicated to ask a lot more colleagues for help than the average participant.
- Like other participants, you mostly seek help and advice from colleagues in the same hierarchical level and those you see frequently.
- You ask a little less frequently for help than the average participant, but you learn just as much.
- From earlier research we know that professionals who have a large, hierarchically diverse network with a high learning value perform better on tasks and advance faster in their careers.

———— overall score ———— your personal score

YOUR PERSONALIZED FEEDBACK | ID 154

3. YOUR PERFORMANCE ON THE CASE

In the case you completed, we looked at whether you accessed all relevant information (especially the profit and loss statements and cash flow statements of the three debtors (we consider you informed if you accessed these boxes), and whether your judgment of the three debtors reflected the situation in the case (we consider your judgment accurate when you felt Koraal was most likely to pay, Roover was probably paying, while Jonker was least likely to pay). The experiment also consisted of two rounds. If you did not make an accurate judgment in round 1, you could access all information again. After round 2, we also measured your performance. Below, you can find information on how well all participants performed, and to which group(s) you belong.



During both rounds of the case, you did not access the relevant evidence you need to make an accurate judgment. We noticed that you provided very high estimates of confidence in your judgment in round 1 – upward of 80%. This could mean that you were unaware you did not possess relevant evidence to make a judgment. Focus on what kind of evidence you would need to confirm and disconfirm different hypotheses, and ask for help if necessary.

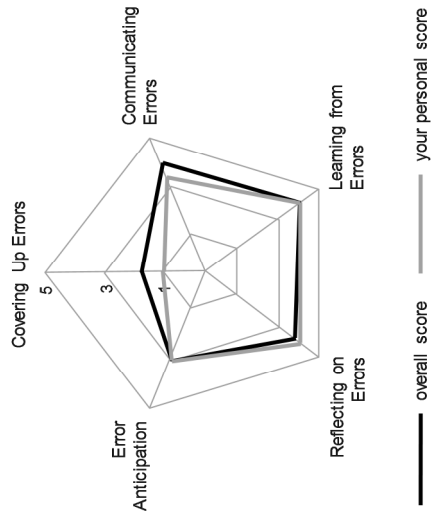
YOUR PERSONALIZED FEEDBACK | ID 151

Thank you again for your participation in last week's experiment on the role of learning from daily experience for constructively handling audit errors. This feedback sheet gives you an overview of your scores relative to those of all other participants. We included small comments on what we have learned from research so far to support you in your further development.

1. YOUR ERROR ORIENTATION

This factor measures your attitude towards handling errors in the workplace. This attitude can reflect both your personality and the environment at your firm.

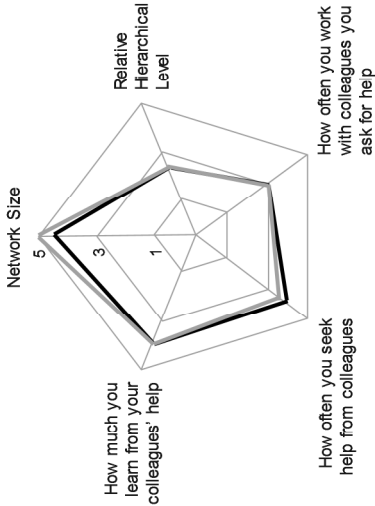
- Just like the average participant, your attitude towards communicating errors, learning from errors, reflecting on errors, and anticipating errors is quite positive.
- You score a little lower on covering up errors than the average participant. This is a good basis for actually learning from your own errors.
- We find that participants were least likely to cover up an error when they feel that their managers and colleagues encourage them to learn from errors and when they can easily communicate errors with colleagues in the firm.



YOUR PERSONALIZED FEEDBACK | ID 151

2. YOUR HELP NETWORK

This factor measures who you turn to for help and why. It is a measure of how much learning behavior you show after experiencing a (potential) error.



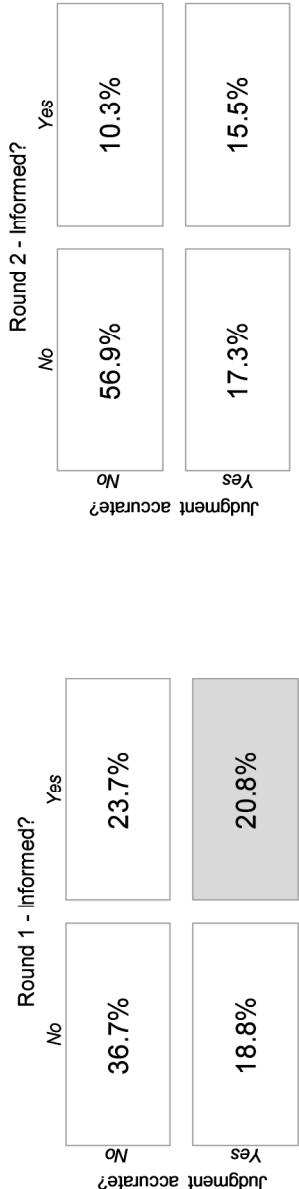
- The network of colleagues you turn to for help is a little larger than the average participants'.
- On average, you indicate to ask colleagues on the same hierarchical level for help as do the other participants.
- You ask slightly less frequently for help than the other participants, but learn just as much.
- From earlier research we know that professionals who have a large, hierarchically diverse network with a high learning value perform better on tasks and advance faster in their careers.

———— overall score ————— your personal score

YOUR PERSONALIZED FEEDBACK | ID 151

3. YOUR PERFORMANCE ON THE CASE

In the case you completed, we looked at whether you accessed all relevant information (especially the profit and loss statements and cash flow statements of the three debtors (we consider you informed if you accessed these boxes), and whether your judgment of the three debtors reflected the situation in the case (we consider your judgment accurate when you felt Koraal was most likely to pay, Roover was probably paying, while Jonker was least likely to pay). The experiment also consisted of two rounds. If you did not make an accurate judgment in round 1, you could access all information again. After round 2, we also measured your performance. Below, you can find information on how well all participants performed, and to which group(s) you belong.



- ▶ You completed the case in the first round, and you accessed all relevant information and formed an accurate judgment – congratulations. You score among the top 20.8% of all participants of this experiment.

APPENDIX VI

ABOUT THE AUTHOR

In 2009, Therese Grohnert graduated with a BSc. International Business Economics from the School of Business and Economics, Maastricht University, having spent an exchange semester at the Université Paris 1 Sorbonne Panthéon. After graduation, Therese followed extracurricular courses in cognitive psychology and interned at a large energy company. Returning to Maastricht for her master studies, she graduated in 2011 with an MSc. Management of Learning.

Following her research experience as a student assistant in the fields of student acculturation and blended learning, Therese began her work as media developer and junior lecturer at the Department of Educational Research and Development. Between 2011 and 2013, she was part of the 'Learning and Working' team, working for a cross-faculty initiative to establish blended learning at Maastricht University for undergraduate, graduate, and post-graduate education.

Based on a small research project funded by Network Social Innovation, Therese began her PhD trajectory in 2013, collaborating with a Big 4 firm in studying judgment and decision-making and workplace learning in the audit context. Findings of this project were shared continuously with practice, and within the academic fields of workplace learning and auditing. For her work, Therese received the "Best Paper by a New Investigator Award" from the American Educational Research Association in 2014, and the "Special Interest Group 'Learning and Professional Development' Best Paper Award" from the European Association for Research on Learning and Instruction in 2015. In 2016, Therese also had the opportunity to spend two months with Prof. Amy Edmondson at Harvard Business School.

Next to pursuing her research, Therese designed and taught courses and modules at the undergraduate, graduate and post-graduate level, making workplace learning accessible to students and professionals from different fields and backgrounds.

APPENDIX VII

LIST OF PUBLICATIONS AND VALORIZATION ACTIVITIES

PEER-REVIEWED JOURNAL ARTICLES

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (accepted). Valuing Errors for Learning: Espoused or Enacted?. *Journal of Workplace Learning*, Special Issue on "Learning from Errors in Workplace Settings"

Grohnert, T., Beusaert, S. A. J. & Segers, M. (2014). Pitfalls of Personal Development Plans - The User Perspective. *Journal of Vocational Education and Training*, 66(1), 74-88.

Eisele, L., Grohnert, T. & Beusaert, S. A. J. (2013). Employee Motivation for Personal Development Plan Effectiveness. *European Journal of Training and Development*, 37(6), 527-543.

Rienties, B., Beusaert, S. A. J., Grohnert, T., Niemantsverdriet, S. & Kommers, P. (2012). Understanding Academic Performance of International Students: The Role of Ethnicity, Academic and Social Integration. *Higher Education*, 63(3), 685-700.

In progress

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (under review) Supporting Auditors in Learning from their Errors: A Social Network Perspective. *Behavioral Research in Accounting*.

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (under review) Minimizing Professionals' Overconfidence by Maximizing Learning: Feedback, Checklists and Reflection *Organizational Behavior and Human Decision Processes*.

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (under review) Developing Auditors' Professional Skepticism: The Effect of Workplace Learning on Audit Quality. *Accounting, Organizations and Society*.

PEER-REVIEWED BOOK CHAPTERS

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (accepted). Deliberate Practice as a Lever for Professional Judgment - Lessons from Informal Workplace Learning. In G. Messmann, M. Segers, & F. Dochy (Eds.), *Informal learning in the Workplace*. Dordrecht: Springer.

Gerken, M., & Grohnert, T. (2014). Reframing Higher Education – Best Practices from Online Instructors in Distance Education. In A. Dailey-Hebert & Dennis, K.S. (Eds.) *Transformative Perspectives and Processes in Higher Education*, Dordrecht: Springer Netherlands.

Beusaert, S. A. J., Grohnert, T., & Segers, M. (2014). Personal Development Plan, Career Development and Training. In Kraiger, K., Passmore, J., Malvezzi, S., & Rebelo dos Santos, N. (Eds.) *The Wiley-Blackwell Handbook of the Psychology of Training, e-Learning, Personal Development, Appraisal and Feedback*. London, UK: Wiley

Bohle Carbonell, K., Dailey-Hebert, A., Grohnert, T. (2013). Problem-Based Learning in Hybrid, Blended, or Online Courses: Instructional and Change Management Implications for Supporting Learner Engagement. In C. Wankel, P. Blessinger (eds.). *Increasing Student Engagement and Retention in e-Learning Environments: Web 2.0 and Blended Learning Technologies*. New York: Emerald Group Publishing Limited.

Grohnert, T., Bohle Carbonell, K., Dailey-Hebert, A., Segers, M. (2013). An Evaluation Model for Online Courses: The Impact of Knowledge Sharing and Communication Climate. In P. van den Bossche (ed.). *Facilitating Learning in the 21st Century: Leading Through Technology, Diversity and Authenticity*. Dordrecht: Springer Netherlands.

Rienties, B., Grohnert, T., Kommers, P., Niemantsverdriet, S., Nijhuis, J. (2011). Academic and Social Integration of International and Local Students at Five Business Schools, A Cross-Institutional Comparison. In P. van den Bossche, W.H. Gijssels and R.G. Miltner (Eds.), *Building Learning Experiences in a Changing World*. Dordrecht: Springer Netherlands.

PEER-REVIEWED CONFERENCE PRESENTATIONS

Grohnert, T., Meuwissen, R. H. G., & Gijsselaers, W. H. (2016). *Mitigating the Dunning-Kruger Effect: Improving Staff Auditors' Judgment Quality after Poor Performance*. Paper presented at the 6th Workshop on Audit Quality, European Institute for Advanced Studies in Management, September 30th - October 1st, Florence, Italy.

Grohnert, T., Meuwissen, R. H. G., & Gijsselaers, W. H. (2016). *Leveraging Professional Judgment Quality*. Paper presented at the EARLI SIG 14 Conference, August 24-26, 2016, Regensburg, Germany.

Grohnert, T., Meuwissen, R. H. G., & Gijsselaers, W. H. (2016). *Leveraging Professional Judgment Quality*. Paper presented at the EARLI SIG 14 Conference, August 24-26, 2016, Regensburg, Germany.

Grohnert, T., Meuwissen, R. H. G., & Gijsselaers, W. H. (2016). *Supporting Young Professionals' Judgment Quality*. Paper presented at the EARLI SIG 14 Conference, August 24-26, 2016, Regensburg, Germany.

Grohnert, T., Meuwissen, R. H. G., & Gijsselaers, W. H. (2016). *Preventing the Covering Up of Errors: Designing professional work environments for learning from errors*. Paper presented at the Annual Meeting of the American Educational Research Association, April 8-12, 2016, Washington D.C., USA.

Grohnert, T., Meuwissen, R. H. G., & Gijsselaers, W. H. (2016). *Be(com)ing (Over-) Confident? The Role of Task Experience and Gender in attitudinal and cognitive overconfidence*. Paper presented at the Annual Meeting of the American Educational Research Association, April 8-12, 2016, Washington D.C., USA.

van der Haar, S., & Grohnert, T. (2015). *Complex Crises - Complex Decision-Making*. Workshop presented at the 2nd Complex Interactive Processes (CIP) Conference, July 2-3, 2015, Amsterdam, The Netherlands.

Grohnert, T., Meuwissen, R. H. G., & Gijsselaers, W. H. (2015). *Managing Audit Errors: Preventing the Covering Up and Enabling the Learning from Errors*. Poster presented at the 21st International Symposium on Audit Research, June 19-20, 2015, Boston, USA.

Grohnert, T., Meuwissen, R. H. G., & Gijsselaers, W. H. (2014). *Uninformed and Unaware- Enabling Professionals to Make Informed Judgments in Low-*

Validity Environments. Paper presented at the EARLI SIG 14 Conference, August 27 - 29, 2014, Oslo, Norway. Received the EARLI SIG 14 Best Paper Award

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (2014). *Developing Professional Skepticism - The Learning Perspective*. Paper presented at the Annual Meeting of the American Educational Research Association, April 3-7, 2014, Philadelphia, USA.

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (2014). *Supporting Professional Learning in Low-Validity Environments: Lessons From Deliberate Practice*. Paper presented at the Annual Meeting of the American Educational Research Association, April 3-7, 2014, Philadelphia, USA. Received the AERA Division I Best Paper by a New Investigator Award

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (2014). *Uninformed and Unaware - How Low-Validity Cues Trigger Faulty Judgments Through Overconfidence*. Poster presented at the Annual Meeting of the American Educational Research Association, April 3 – April 7, 2014, Philadelphia, PA, USA.

Grohnert, T., Meuwissen, R. H. G., & Gijssels, W. H. (2013). *Illusion of Validity in Judgment and Decision Making*. Round table presented at Junior Researchers of EARLI (JURE), 26-27 August 2013, Munich, Germany.

Grohnert, T., Beausaert, S. A. J., & Segers, M. (2012). *Pitfalls when Implementing Personal Development Plans – The Role of Job Satisfaction and Job Pressure*. Presented at the 19th EDINEB conference, The role of business education in a chaotic world, 2-4 May 2012, Haarlem, The Netherlands. Nominated for the best paper award

Grohnert, T., Beausaert, S. A. J., Fouarge, D. (2012). *An effective PDP – A Question of Feedback?* Presented at the Onderwijs Research Dagen, 20-23 June 2012, Wageningen, The Netherlands

Rienties, B., Grohnert, T., Nijhuis, J., Kommers, P., & Niemantsverdriet, S. (2009). *Academic and Social Integration of International and Local Students - A Cross-Institutional Comparison*. Presented at S-ICT, 16-17 December 2009, Amsterdam, The Netherlands.

Rienties, B., Kommers, P., Niemantsverdriet, S., Jacobi, R. Nijhuis, J., Tempelaar, D., & Grohnert, T. (2009). *International Student Mobility, A Cross-Institutional Comparison of Academic and Social Integration of*

International and Local Students. Presented at ELM, 22-24 October 2009, Maastricht, The Netherlands.

Rienties, B., Tempelaar, D., & Grohnert, T. (2009). *A cross-country comparison of 120 effective online courses to facilitate mobility of lifelong learners*. Presented at ELM, 22-24 October 2009, Maastricht, The Netherlands.

VALORIZATION ACTIVITIES RELATED TO THIS DISSERTATION

Grohnert, T., Meuwissen, R. H. G., Gijsselaers, W. H., Bik, O., & Bouwens, J. (2016). *1st Foundation for Auditing Research (FAR) Masterclass: 'Learning from Auditors' Errors'* Workshop delivered for auditors and regulators, 22-11-2016, Amsterdam, The Netherlands

Grohnert, T., & Gijsselaers, W. H. (2016). *Failing Forward - Enabling Auditors to learn from errors*. Workshop for 70 auditors at a Big 4 firm, 04-10-2016, Amsterdam, The Netherlands.

van der Haar, S., & Grohnert, T. (2016). *De Menselijke Factor in Besluitvorming & High Impact Learning*. Workshop for crisis coordinators of the Dutch Ministry of Infrastructure and Environment. 15-05-2016, Driebergen, The Netherlands.

Grohnert, T. (2016). *Exploring Overconfidence - A Learning Perspective*. Colloquium for honors students at the School of Business & Economics, 02-03-2016.

Grohnert, T. (2015). *What drives your judgment?* Presentation for auditors of a Big 4 Firm, 15-12-2015, Amsterdam, The Netherlands.

Starmans, J., Wolters, K., van der Haar, S., & Grohnert, T. (2015). *Teaminteractie en BOB in het Actiecentrum*. Workshops for members of the crisis center of a Dutch chemical park. 27-11-2015 - 4-12-2015, Geleen, The Netherlands.

Grohnert, T. (2015). *Tipping the scales – creating conditions for effective feedback*. Keynote for a Study Day of the Faculty of Arts and Social Sciences, Maastricht University, 09-06-2015.

van der Haar, S., Grohnert, T. (2015). *Hoe we onszelf soms ongemerkt voor de gek houden. De menselijke factor in besluitvorming*. Interactive workshop for members of the Instituut Fysieke Veiligheid, 21-05-2015, Maastricht, The Netherlands.

Gijselaers, W. H., & Grohnert, T. (2015). *Who's next: Why good experience does not equal good performance*. Workshop at the 2015 Management of Learning Day, 14-04-2015.

Gijselaers, W.H., & Grohnert, T. (2015). *Why chasing talent destroys opportunities for learning*. Breakfast Booster / Interactive workshop for professionals in the Limburg Area, organized by Maastricht University's Post-Graduate Education. 06-03-2015.

Gijselaers, W.H., & Grohnert, T. (2015). *When talent matters, it is no longer a matter of talent!* Interactive seminar for participants of the Euro*MBA program of Maastricht University, 12-01-2015.

Grohnert, T. (2014). *Leren van kritische incidenten vs. routine ervaring*. Interactive workshop for professionals at a study day of the Dutch Institute of Psychologists (NIP), 06-11-2014, Utrecht, The Netherlands.

Gijselaers, W.H., & Grohnert, T. (2014). *Excellent performance is a lot easier than it is. How the work environment affects performance*. Research lunch presentation for the School of Health Education, Maastricht University. 16-06-2014.

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338. Gerken, M. (29-06-2016). How do employees learn at work ? Understanding informal learning from others in different workplaces. Maastricht: Maastricht University.
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340. Geel, M.J.M. van, & Keuning T. (08-07-2016). Implementation and Effects of a Schoolwide Data- Based Decision Making Intervention: a Large-Scale Study. Enschede: University of Twente.

341. Bouwer, I.R., & Koster, M.P. (02-09-2016) Bringing writing research into the classroom: The effectiveness of Tekster, a newly developed writing program for elementary students. Utrecht: Utrecht University.
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345. Scheer, E.A. (23-09-2016). Data-based decision making put to the test. Enschede: University of Twente.
346. Bohle Carbonell, K. (28-9-2016). May I ask you....? The influence of Individual, Dyadic, and Network Factors on the Emergence of Information in Exchange Teams. Maastricht: Maastricht University.
347. Claessens, L.C.A. (30-09-2016). Be on my side, I'll be on your side: Teachers' perceptions of teacher– student relationships. Utrecht: Utrecht university.
348. Jansen in de Wal, J. (18-11-2016). Secondary school teachers' motivation for professional learning. Heerlen: Open University of the Netherlands.
349. Kock, W.D. de. (24-11-2016). The effectiveness of hints during computer supported word problem solving. Groningen: University of Groningen.
350. Oonk, C. (07-12-2016). Learning and Teaching in the Regional Learning Environment: Enabling Students and Teachers to Cross Boundaries in Multi-Stakeholder Practices'. Wageningen: Wageningen University.
351. Beckers, J. (09-12-2016). With a little help from my e-portfolio; supporting students' self directed learning in senior vocational education. Maastricht: Maastricht University.
352. Osagie, E.R. (14-12-2016) Learning and Corporate Social Responsibility. A study on the role of the learning organization, individual competencies, goal orientation and the learning climate in the CSR adaptation process. Wageningen: Wageningen University.

